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A preliminary Contribution to a Knowledge of the Hydnaceae

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It is the purpose of the present paper to review our knowledge of the American mesopus forms of the genus *Hydnum*, with a view to call attention to these plants and prepare the way for an ultimate thorough revision of the group. In the present chaotic state of our knowledge of these plants, accuracy in the discrimination of species or in the formulation of a synopsis is often impossible; it is hoped, however, that the paper may be found of some service to the field botanist. The writer has found himself greatly hampered in his work by the difficulty of obtaining sufficient material for his purpose. It has seemed best, therefore, to prepare this contribution, imperfect though it must be, to encourage the coöperation of collectors in the accumulation of material and notes for a more thorough study of the group. Thus far the work has been based to a great extent on herbarium material, which, particularly in the fleshy forms, has proven very unsatisfactory. It is important that the plants should be studied in the living condition and ample notes made of their characteristics. Unquestionably there are many species at present confounded under a single name. This seems especially the case with *H. imbricatum*, *H. ferrugineum*, and *H. zonatum*. It is probable that this is due partly to the scattered and inaccessible character of the literature on this group but chiefly, doubtless, to the fact that the forms have not received a careful comparative study, which can only be accomplished with

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the aid of an abundance of material supplemented by excellent field notes. It will therefore, be pertinent to present a few suggestions concerning the field work.

I. COLLECTION

The Hydnaceae are to be found almost everywhere, but more especially in woodlands. The mesopus forms are nearly all terrestrial, while the other forms are as universally lignatile. The plants are readily recognized by the characteristic feature of the hymenial surface being in the form of awl-shaped spines projecting downward. In other respects the mesopus forms, that is, those having a central stem, resemble the ordinary toadstools. In collecting, plenty of material should be gathered that every variation of the plant may be shown. No collector should be satisfied with a half dozen plants if more can be obtained; scrappy collections have been the bane of mycologists. The entire plant should be removed, including if possible a portion of the substratum. Plants of different collecting should be kept separate, even if believed to be of the same species. A good way to protect them is to lay down a piece of tissue paper and, piling the plants in the middle, fold the paper carefully around them and deposit in a basket or collecting case. The author generally uses paper bags into which the plants can be easily slipped and, if liable to injury, can be removed by tearing the bag. In putting up material in this way it is a good plan to select one of the best plants and, taking a piece of colored paper, tear a hole in it through which the stem may be passed and then slip the paper up close to the pileus; the plant may then be wrapped up with its fellows. When the time comes to care for the specimens this paper will usually be found to furnish a very good spore print. The paper in which the plants are wrapped should be marked to correspond to the field notes.

II. PRESERVATION

The fleshy forms are especially subject to decay and should be cared for the same day as collected if possible, while none should be left more than twenty-four hours. The tough or woody species and resupinate forms may be very well preserved by rapid drying in a current of hot air. An excellent method is to suspend them

in a wire basket over a stove where they may be heated as much as possible without danger of scorching. This will insure the destruction of insects, eggs and larvae. If then placed in small paper boxes, or, if not intended immediately for the herbarium, in tight paper bags with a few moth balls, they will be practically safe from these ravagers.

The fleshy species will undergo a greater change in this process of drying, sometimes so great as to be wholly unrecognizable; it is, therefore, necessary in addition to make special preparations of one or two specimens. This may be done by (1) Cutting a vertical slice through center of pileus and stem; (2) Half the remaining pileus is placed right side up, the other half with the under side up; (3) The remainder of the stem is placed with its outer surface uppermost, and the plant thus spread out is pressed and dried between dryers as in the case of a flowering plant, but with less pressure.

A spore print should be obtained in every case where it is possible. This should be taken on a square of plain paper, light or dark colored, in contrast with the color of the spores. The print may be obtained in two ways: (1) As indicated above under "Collection"; this will give excellent results as to color of spores and does not injure the plant; but (2) If a typical spore print is desired, the stem should be cut from the plant close to the under surface of the pileus, and the latter placed with the hymenial surface downward, on a sheet of paper of the proper color and then protected from draughts by inverting a bell glass or tumbler over it. The spore print may be permanently fixed by spraying with a solution of white shellac in alcohol by means of an atomizer.

III. NOTES

As there is no convenient method of preserving these plants in a fresh condition, good field notes become of the utmost importance. In fact, specimens without accompanying notes are oftentimes practically worthless.

On finding a plant or group of plants, there should be noted first, the environment and character of substratum, the growth habit, whether solitary, scattered, grouped, or cespitose. Then the plant itself should be examined and all its features carefully

noted: the color whether varied or uniform; size of plant, giving actual dimensions; form of pileus and character of surface; in the scaly species the character and size of scales should be carefully determined; form and character of stem; texture of plant and structure of the interior should be fully described; color and character of teeth, whether coarse, fine, long, short, giving actual dimensions as far as possible; the color of the spores is important, as is also their size, form, and markings, but this will require the use of a compound microscope; the odor, when fresh and also in process of drying, and the taste are quite important; change of color in the fresh specimen when bruised or cut should be looked for; color and character of the juice of the plant should be observed; while even the character of the insect and other animal life for which it may furnish pabulum is not unworthy of the botanist's attention. Special care must be taken to keep the specimens and notes numbered to correspond correctly.*

In the following synopsis several species included in the notes will be found to be omitted. This is for the reason that an attempt to arrange them in synoptical form at present would be only guess work. Most of these, however, are included in the *species dubiae* and it is doubtful if they are really American species. On the other hand, there are a number of plants met with in the herbaria and, therefore, very likely to be found again in nature, which have heretofore been referred erroneously to known species; no attempt has been made to provide for these in the synopsis as their characters are too little known and it is quite probable that they will prove to be undescribed species.

There has been no attempt to adjust the taxonomic relations of the group, nor has its nomenclature been disturbed even where it is known that changes must be made: but the iconography and exsiccati have been given quite fully as these may be of value to those who have access to large collections and libraries.

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* Very helpful and more complete instructions in the collection and preservation of all kinds of fungi have been published in the following works: **Burt,** On Collecting and Preparing fleshy Fungi for the Herbarium. Bot. Gaz. **25**: 172–186. *pl. 14.* 1898. **Underwood,** Moulds, Mildews, and Mushrooms, 201–206. 1899. **Atkinson,** Mushrooms, edible, poisonous, etc. 222–229. 1900.

Synopsis of Species

Lignatile; small, 2 cm. wide; dark green throughout. 1. *H. atro-viride.*
Terrestrial.
Substance of pileus fleshy, brittle.
Bright colored, white, yellow, or orange.
White; spores small, less than 6 μ wide.
Plant small, less than 3 cm. wide. 3. *H. albidum.*
Plant larger, more than 5 cm. wide. 4. *H. albo-magnum.*
Buff or yellow; spores more than 5 μ wide.
Teeth decurrent.
Plant solitary. 5. *H. Washingtonianum.*
Plants cespitose, flesh turning yellow when cut. 6. *H. caespitosum.*
Teeth not decurrent or but slightly so. 2. *H. repandum.*
Pileus cracked and split. 7. *H. diffractum.*
Dull colored, fuscous, ferruginous, or gray.
Pileus smooth.
Pinkish gray, stem scabrous. 13. *H. scabripes.*
Brownish.
Teeth not decurrent or but slightly so; pileus expanded, plane, smooth. 9. *H. laevigatum.*
Teeth decurrent.
Pileus infundibuliform, stem slender. 10. *H. infundibulum.*
Pileus plane or convex. 29. *H. fusipes.*
Pileus scaly or tomentose.
Plants solitary.
Scales thick, regularly imbricate. 12. *H. imbricatum.*
Scales thin, irregular, superficial. 11. *H. subsquamosum.*
Plants cespitose.
Plants confluent, stem somewhat branched. 30. *H. versipelle.*
Plants distinct, stem slender, flexuose. 37. *H. Fennicum.*
Substance of pileus tough, corky, woody, or coriaceous.
Surface of pileus zonate.
Teeth in age light colored, white to yellow. 26. *H. cyathiforme.*
Teeth in age dull colored, gray or brown.
Pileus regular, stem subcentral, substance uniform.
Pileus more or less infundibuliform, strigose, with a sterile margin.* 22. *H. zonatum.*
Pileus expanded, umbilicate.
Zonations elevated; pileus less than 4 cm. wide. 25. *H. fasciatum.*
Zonations not elevated; pileus more than 4 cm. wide. 23. *H. confluens.*

* If obscurely zonate with the funnel more or less filled with a mass of coarse spongy substance *cf. H. scrobiculatum.*

Pileus irregular, lobed; stem eccentric; substance in two layers, the outer spongy, tomentose, the inner compact, darker.
16 *H. putidum.*

Plant zonate internally only,* not on the surface of the pileus.
Hard, woody texture throughout, at least when dried
Light colored, yellow, buff, or orange. 20. *H. aurantiacum.*
Gray to smoky; substance variegated with blue (?).
32. *H. compactum.*
Pileus composed of two layers, the lower hard, compact, continuous with stem, the upper consisting of a mass of dense felty tomentum.
Plant ferruginous, concolorous; stem covered with a felty tomentum.
19. *H. spongiosipes.*
Pileus variegated, light to dark brown, without tomentum on stem.
18. *H. ferrugineum.*
Pileus coriaceous, more or less infundibuliform, the surface rugose or broken up into a coarse spongy mass.
Color brown. 21. *H. s robiculatum.*
Color ash-gray. 28. *H. canum.*
Plant azonate.
Inner substance of pileus and stem blue-black.
Surface of pileus gray, convex to plane; plant tomentose and bibulous when fresh. 15. *H. albonigrum.*
Surface of pileus buff or cream colored, concave to infundibuliform.
17. *H. suaveolens* (?).
Inner substance of pileus and stem brown to fuscous.
Spores white.
Pileus tough, corky; plant confluent, spreading, forming a crust-like mass. 14. *H. vellereum.*
Pileus coriaceous, stem slender. 40. *H. graveolens.*
Spores ferruginous or fuscous. 34. *H. mirabile* (?).

1. HYDNUM ATRO-VIRIDE Morgan, Jour. Cin. Soc. Nat. Hist. **18**: 38. *pl. 1. f. 5.* 1895

ICON.: Morgan, *loc. cit.*

TYPE LOC.: Auburn, Ala. (Atkinson).

This species has not been reported since Atkinson discovered it in Alabama. It is a small plant, "1–2 cm. wide" and is clearly distinguished by its peculiar dark green color throughout, which is characteristic even of the spores. It is further unique in being, apparently, the only central stemmed form that grows on wood.

2. HYDNUM REPANDUM L. Sp. Pl. **2**: 1178. 1753

ICON.:† Bulliard, Herbier de la France. *pl. 172 !;* Sowerby,

* This zonation can be observed by making a vertical section through pileus and stem.

† In this extensive list an attempt has been made to roughly indicate degree of excellence. Those followed by one ! are fair to good, those followed by two !! are unusually excellent and faithful representations, while all others are indifferent or worthless.

Eng. Fung. *pl. 176!*; Barla, Champ. de Prov. de Nice *pl. 39. f. 1–9!*; Sicard, Hist. nat. Champ. *pl. 58. f. 293*; Britzelmayer, Hym. Sudb.* *Hydnei f. 4*; Bolton, Geschichte *pl. 89*; Krombholz, *pl. 50. f. 1–9!*; Badham, Escul. Fung., ed. 1847, *pl. 12. f. 3*; Badham, *op. cit.*, ed. 1863, *pl. 8. f. 3 & 4*; Bel. Champ. Tarn. *pl. 7*; Fries, Sverig. ätl. svamp. *pl. 15. !!*; Paul, Icon. des Champ. *pl. 35. f. 1–2*; Harzer, Naturg. Abb. Pilze. *pl. 23. pl. 46* (*var.*); Hussey, Ill. Brit. Myc. **1**: *pl. 16 !!*; Vittadini, Desc. Fung. Mang. *pl. 25. f. 2*; Peck, Reg. Rep. **48**: *pl. 38. !*; Rep. Conn. Board Agric. **29**: *pl. 6. f. 2!*; Cordier, Les Champ. *pl. 43!*; Gillet, Les Champ. *pl. 322*; † Gibson, Edible Toadstools and Mushrooms, *pl. 27 !!*; Dietrich, Forstflora, ed. 1840; **2**: *f. 187. Idem.*, ed. 1860; *pl. 291. f. 1.* Atkinson, Mushrooms, *pl. 68.*

Exsicc.: Sydow, Myc. Marchica, 2819; Rabenhorst, Fungi Eur. 803; Desmazieres, Pl. Crypt. de France, 312; Herpell, Samml. präp. Hutp. 18.

Type Loc.: European (Giss).

Orono, Me. (Harvey); Mt. Everett, Mass., West Goshen, Conn., New York City (Underwood); Flatbush, L. I. (Zabriskie); Sandlake, Rensselaer Co., N. Y. (Peck); Ft. Edward, N. Y. (E. C. Howe) New Jersey (Ellis); Pennsylvania (Schweinitz); Fayette, Co., W. Va. (Nuttall). It has also been reported, but specimens have not been examined, from Rhode Island (Olney, Bennett); Ohio, Kentucky (Morgan); Maryland (Banning); North Carolina (Schweinitz); South Carolina (Curtis).

This is one of our most common and widely distributed species. A fleshy, terrestrial, subcentrally stemmed plant; it is readily distinguished by its light color, pale-buff to yellow, sometimes reddish, never white. Its only slightly decurrent teeth separate it at once from *H. Washingtonianum* Ell., its color and large spores, 7–9 μ wide, separate it distinctly from *H. albidum* Pk. and from the large white southern form.

* This is a wretched piece of work whether regarded from a scientific or from an artistic standpoint. It is often impossible to decide from the figures what they are intended to represent. It is especially unfortunate that Britzelmayer has in this work published many new species, whose characters, without an accurate description, are most effectually obscured.

† The plates of this work originally unnumbered are here numbered in accordance with the Lists of the author.

2b. HYDNUM RUFESCENS Persoon: Obs. Myc. **2**: 95. 1799

ICON.: Bolton, Geschichte *pl. 89;* Barla, Champ. de Prov. de Nice *pl. 39. f. 10–12;* Britzelmayer, Hym. Südb. *Hydnei f. 5;* Patouillard, Tab. analyt. Fung. *f. 147;* Peck, Reg. Rep. **48**: *pl. 38. f. 7–10.*

TYPE LOC.: European.

This has been reported from New England (Oakes); Maryland (Banning); Pennsylvania and North Carolina (Schweinitz).

The status of the species is doubtful and it seems best to regard it as a variety of *H. repandum* from which it appears to differ only in its more slender stem and in the reddish color of the pileus. If it can show no more marked characteristics than these it should hardly be given the dignity of a distinct species. Barla's figures, *op. cit.*, show a marked scaly imbricate pileus! Persoon in Syn. Meth. Fung. 556, says: "Pileus obsolete et subtiliter zonatus est." There seems to be no indication of either of these features in our American plant. The name itself is preoccupied by *H. rufescens* Schaeffer, Fung. Bav. et Pal. Icon. **4**: 95. *pl. 141.* 1763, which seems to be even more clearly true *H. repandum.*

3. HYDNUM ALBIDUM Peck, Bull. N. Y. State Mus. Nat. Hist. **1**: 10. 1887

ICON.: Peck, Rep. Reg. **51**: *pl. 56. f. 1–7.*

TYPE LOC.: Sandlake, Rensselaer Co., N. Y. (Peck).

The species has been reported, I believe, only from Middlebury, Vt. (Burt), since Peck first described it. It is probable that it is usually referred to *H. repandum* from which it is not readily distinguished. While characteristically a smaller plant than *H. repandum* (2–3 cm. broad), specimens of the latter are often found equally as small. When fresh, its white color should distinguish it, but in the dried state the color resembles that of *H. repandum* too closely to be distinguished. The most certain distinction seems to be in the spores which are about half the size of those of *H. repandum*, being from 3.5 μ to 5.5 μ wide, but in form they are very similar. Careful field observation of this plant is very desirable.

4. **Hydnum albo-magnum** sp. nov.

A low broad fleshy plant "white throughout, then turning yellowish." Pileus even, glabrous, repand, 5–8 cm. wide; substance fleshy, brittle, white; stem short, thick, central, or excentric, 2–4 cm. high, 1–2.5 cm. thick, expanding into a thick base; teeth slender, 2–4 mm. long, slightly decurrent: spores somewhat irregular but distinctly oval, apiculate, small, 3.5–4 μ by 5.5–7 μ.

TYPE LOC.: Auburn, Ala. (Earle).

The plant, while closely related to *H. repandum* and *H. albidum*, seems to be readily distinguished from the former by its white color, glabrous pileus, and small oval spores; from the latter it is separated by its much larger size, stouter stem, and oval form of spores. The above description is based entirely on dried specimens and needs to be confirmed by comparison with the living plant.

5. HYDNUM WASHINGTONIANUM Ell. & Everh. Proc. Phila. Acad. 1894: 323. 1894

TYPE LOC.: Tracyton, Wash. (Parker).

This plant has not been reported since it was found by Miss Parker. It resembles *H. repandum* but the teeth are decurrent half way down the stem and the "substance tougher."

6. HYDNUM CAESPITOSUM Banning; Peck, Reg. Rep. **44**: 74. 1891

ICON.: Banning, Fungi of Maryland, *pl. 137*.*

TYPE LOC.: Carroll Co., Md. (Banning).

The plant has not been reported by any one but Miss Banning. Her description as quoted by Peck, *loc. cit.*, is too brief to be very satisfactory but is materially supplemented by her plate. The plant, which appears to be closely related to *H. repandum*, seems to differ from that species, especially in the round, thick, convex, nearly hemispherical pileus, the proportionately thickened stem, equal to a third or a half the diameter of the pileus, and in the flesh turning yellow when cut.

7. HYDNUM DIFFRACTUM Berk. Lond. Jour. Bot. **6**: 323. 1847

TYPE LOC.: Waynesville, O. (Lea).

Since its original discovery by T. G. Lea, this plant has been

* This is a work in manuscript deposited in the N. Y. State Herbarium at Albany.

reported only by A. P. Morgan from Kentucky and Ohio. I have not seen an unquestionable specimen of it and am in doubt as to its true character. As this is a strictly American plant and seems to be well characterized, it is desirable that it should be better known and better represented in our herbaria, especially considering that it is now over fifty years since it was first described by Berkeley, and yet in that time only two specimens of it have ever been reported. As the original description will not be readily accessible to many, I add it in part for the purpose of assisting in the identification of the plant.

"Pileus 3 inches broad, convex smooth, of a tough, fleshy substance, at length much cracked and split, margin involute. Stem 1½–2 inches high, ¾ of an inch or more thick, buff, and split like the pileus, tender when fresh. Spines even, subulate, entire, soft, of a pale buff. Smell vinous. A remarkable rigid species when dry."

"Allied to *H. candidum* and *H. repandum*." Lond. Jour. Bot. **6**: 323. 1847.

It is to be hoped that collectors, especially in Ohio, will watch closely for this interesting plant.

8. HYDNUM CURTISII Berk. Grevillea, **1**: 71. 1872

TYPE LOC.: South Carolina (Curtis).

The plant does not seem to be readily distinguished from *H. levigatum* especially in view of the uncertainties connected with the latter. The chief distinctions seem to be the smaller size, less than 5 cm. wide, with the stem attenuate upward from a bulbous base.

It has never been reported since its discovery, but a plant found by Earle in Alabama and now in the Underwood Herbarium has been referred here. It appears to conform fairly well to the description but the latter is too meager to be entirely satisfactory.

9. HYDNUM LEVIGATUM Swartz, Kongl. vet. Acad. nya handl. 1810: 243. 1810

ICON: Fries, Sverig. ätl. Svamp. *pl. 81*. Barla, Champ. Prov. de Nice *pl. 38. f. 5, 6* (?); Bresadola, Fung. Trid. *pl. 138* (?).

TYPE LOC.: European.

New Jersey (Gentry). Reported also from Pennsylvania (Schweinitz) and North Carolina (Curtis). The Schweinitzian specimen now in the Philadelphia Academy of Science is nearly destroyed so that its characters can not be determined. Curtis' specimen I have not seen. It seems doubtful if the plant is common with us. Most of the specimens referred here in the collections are evidently something quite different. I have seen but one specimen (Gentry's) that appeared to have just claim to being regarded as this species.

There seems to be no little uncertainty among authors concerning this plant. Descriptions vary greatly; Barla's figure seems to depict a very different plant from Swartz' and Bresadola's figure is doubtful. The chief distinctive characteristic of the plant is the thick, fleshy, *regular*, *glabrous* pileus, 5–15 cm. wide, by no means repand. Saccardo says, "spores 10–15 μ long."

In view of the uncertainty that seems to prevail concerning this plant and as Swartz's original description is often inaccessible, it is quoted in full.

"*H. laevigatum*, pileo carnoso convexo castaneo laevi, aculeis mollibus albido-cinereis; stipite inaequali elongato. Erinaceus obscure ferrugineus, subtus denticulis, longioribus cinereis. *Stipes* 2–3 pollicatis, teretiusculus inaequalis saepe tortuosus sulcatus, solidus, carnosus, pallidus, crassitie digiti minoris. *Pileus* diam sub 2 pollic. et ultra, modice convexus, centro disci rarius depresso, margine deflexus, carnosus laevis nec squamosus, medio subinde rimosus, fragilis, pallide castaneus l. ferrugineus. *Caro* albescens. *Aculei* numerosissimi, longiusculi subulati, albido-cinerei, fragilissimi, molles."*

10. HYDNUM INFUNDIBULUM Swartz. Kongl. vet. Acad. nya handl. 1810: 244. 1810

ICON.: Svensk. Bot. *pl. 492*.†

TYPE LOC.: European.

Reported from Pennsylvania (Schweinitz); Ohio (Lea, Morgan); Kentucky (Morgan). Schweinitz's specimen in the Philadelphia Academy of sciences is nearly destroyed; what remains

* Kongl. Vetenskaps Acad. nya Handlingar 1810: 243.

† This work has not been seen but as it is the only place where this plant is supposed to be figured it is quoted as above.

rather suggests *H. scrobiculatum*. The Ohio specimens have not been seen. Morgan's Kentucky specimens answer well to the descriptions of *H. infundibulum* except as to size. The European plant is described as 20 cm. wide and with stem 5–8 cm. long and 3 cm. thick. Morgan's specimens are 4–7 cm. wide with stem 4–5 cm. long, a much smaller plant. The plant is distinguished by its infundibuliform pileus, with erect flexuose, plicate margin.

11. HYDNUM SUBSQUAMOSUM Batsch, Elench. Fung. 111. 1783

ICON.: Batsch, Elench Fung. *f. 43!*. Paulet, Icon. Dec. Champ. *pl. 33. f. 1;* the latter simply a copy of Batsch.

TYPE LOC.: European.

Reported from Rhode Island (Bennett); Pennsylvania (Schweinitz); South Carolina (Schweinitz, Curtis, Ravenel). Bennett's Rhode Island specimen is unquestionably *H. scrobiculatum* and therefore must be excluded. Schweinitz's specimen is doubtful, the others have not been seen. Schweinitz's Pennsylvania specimen is identical with a specimen in the Underwood herbarium referred to *H. imbricatum* and characterized by coarse aculei, a slender stem and a remarkably light porous substance to the pileus when dried. This species so far as our American forms are concerned is doubtless involved in confusion with *H. imbricatum*. A thorough investigation is greatly needed of these related species including *H. levigatum*.

12. HYDNUM IMBRICATUM L. Sp. Pl. **2**: 1178. 1753

ICON.: Schaeffer, Fung. Bav. et Pal. Icon. *pl. 140;* Sowerby, Eng. Fung. *pl. 73;* Bolton, Geschichte *pl. 88;* Barla, Champ. de Prov. de Nice *pl. 38. f. 1–4;* Fl. Dan. *pl. 176*; Harzer, Naturg. Abb. Pilze *pl. 3. f. 6–9;* Fries Sverig. ätl. Svamp. *pl. 33;* Gautier, Champ. *pl. 1. f. 3;* Pat. Tab. analyt. Fung. *pl. 245;* Richon and Rose, Atlas Champ. *pl. 65. f. 8–11;* Greville, Scot. Crypt. Flor. *pl. 71;* Atkinson, Mushrooms, *f. 189.*

EXSICC.: Krieger Fung. Sax. 419; Linhart, Fung. Hung. 347; Roumeguere, Fung. Select. 5328; Roumeguere, Fung. Gall. 2310; Sydow, Myc. March. 105; Ellis, N. Am. Fung. 926;* Herpell; Samml. präp. Hutp. 75.

* In one set of N. A. F. under this number there was found a most typical specimen of what I regard as *H. imbricatum*, in another set under the same number the specimen appears to be a very distinct thing and entitled to be treated as a different species.

TYPE LOC.: European.

Reported from Massachusetts (Seymour); New Jersey (Ellis); Montana (Tweedy); New York (Peck); Rhode Island (Bennett); Pennsylvania (Schweinitz); Maryland (Banning); West Virginia (Nuttall); South Carolina (Schweinitz); Ohio (Lloyd); Kentucky (Morgan). This distribution can be regarded only as provisional as the specimens are found, so far as examined, to vary too greatly among themselves. For example, Tweedy's Montana specimen is a gray-brown plant with the pileus broken up into large, thick, imbricate plates, while Morgan's Kentucky plant is yellowish-brown with the pileus covered with numerous fine thin scales. There seems to have been a disposition among collectors to refer everything with a scaly pileus to this species. It seems probable, however, that we have several distinct species masquerading under this name. It is especially desirable that careful observations should be made of fresh specimens of this plant, with reference to the character of the scales, size, arrangement, and structure; also as to the teeth, length, size, color, and whether closely set or not; in addition to the usual points to be observed in the fleshy fungi.

13. HYDNUM SCABRIPES Peck, Reg. Rep. **48**: 13. 1896

TYPE LOC.: Elizabethtown, N. Y. (Peck).

The plant has not been reported since its first discovery by Peck. It is a very peculiar and well-marked species, large and conspicuous, with pileus 9–12 cm. broad, pinkish gray in color; teeth decurrent; stem 9–12 cm. long, scabrous-dotted.

14. HYDNUM VELLEREUM Peck, Reg. Rep. **50**: 110. 1897

TYPE LOC.: Port Jefferson, N. Y. (Peck).

This plant has been found also in Rensselaer Co., N. Y. by the writer. It forms shapeless crusts spread over the substratum of fallen leaves and often assumes nearly a resupinate character. It somewhat resembles *H. albonigrum* but is dryer in substance in the fresh condition and the color of the interior is much lighter, ashy-gray or brownish. It appears to grow in dryer situations than the former plant. Both species emit a strong heavy odor in drying which lasts for months. In *H. vellereum* this odor is quite suggestive of slippery elm.

15. HYDNUM ALBONIGRUM Peck, Reg. Rep. **50**: 110. 1897

TYPE LOC.: Gansevoort, N. Y. (Peck).

Massachusetts (Vail); Moravia, N. Y. (Banker). The plant is readily distinguished by its hard, nearly black central portion surrounded by a spongy-tomentose structure similar to *H. spongiosipes* but color gray-black and teeth white. When fresh this tomentose portion is tumid with water which can be readily squeezed out in drops. The plant grows among fallen leaves in wet springy situations. In drying it emits a heavy odor suggestive of certain fertilizing phosphates. It seems to be closely related to *H. vellereum*, with which it should be compared.

16. HYDNUM PUTIDUM Atkinson, Mushrooms, Edible, Poisonous, etc. 199. *pl. 69. f. 188.* 1900

TYPE LOC.: Blowing Rock, N. C. (Atkinson).

No specimens of this species have been examined but from Atkinson's plate and description it appears to be closely related to the above *H. albonigrum* Pk. from which it is evidently clearly separated by its larger size, "8–12 cm. broad," and by its "prominent concentric zones." The plant is further described as "remarkable for its peculiar odor, resembling, when fresh, that of an Ethiopian; for its tough, zonate pileus with a prominent white edge, and the stout irregular stem, resembling the stem of *Hydnum velutinum*,* with a thick, spongy, outer layer and a central hard core."

It is worthy of note that we evidently have here a group of closely related species that are especially characterized by the possession of a "peculiar odor." It is unfortunate that odors are so difficult to describe. It may be further noted that we also have in this genus a group of species marked by a peculiar double character in the internal structure, consisting of a thick, spongy or tomentose outer layer and a central hard compact portion.

17. HYDNUM SUAVEOLENS Scop. Fl. Carn. **2**: 472. 1772

TYPE LOC.: European.

Ft. Edward, N. Y. (E. C. Howe); Sandlake, N. Y. (Peck); Kentucky (Morgan); Connecticut (Underwood); New Jersey (Ellis).

* This probably refers to the species recognized in this paper as *H. spongiosipes* Pk.

Although this plant has been quite largely reported it seems doubtful if the true *H. suaveolens* of Scopoli has ever been found in this country. This notice of it would, therefore, have been placed with the *Species dubiae*, but that in the collections a plant with uniform characteristics is quite generally found referred to this species. Unless this plant undergoes considerable change in drying it does not appear to possess the characteristic blue color so strongly emphasized in the descriptions of *H. suaveolens* Scop. In many ways the American plant seems closely related to *H albonigrum* Pk. and *H. vellereum* Pk., differing from the former chiefly in the lighter color of the interior (not black) and in the cream colored or buff surface of the pileus. It differs from the latter in the darker color of the interior, and in its buff pileus; it is also more regularly mesopus in form. In fact it appears in many of its features to be intermediate between *H. albonigrum* and *H. vellereum* and is specifically distinguished by its cream colored pileus.

It is very desirable that accurate observations should be made on this plant in its fresh state, and its true position definitely determined.

18. HYDNUM FERRUGINEUM Fries,* Obs. Myc. **1**: 133. 1815

ICON.: Fries Icon. Select. Hym. *pl. 4;* Krombholz. *pl. 50. f. 10, 11.*

Bresadola Fung. Trid. *pl. 143;* Bulliard, Herbier de la France *pl. 409* are cited under this name, but they do not represent *H. ferrugineum* Fr. Bresadola's figure may be possibly *H. scrobiculatum.*

EXSICC.: Roumeguere, Fung. Gall. 2308; Desmazieres, Pl. Crypt. de France 2159 (?); Ravenel, Fung. Amer. 433;† Ravenel, Fung. Car. **3**: 17.‡ Exsiccati appear to furnish no satisfactory information on this species.

TYPE LOC: European.

* Fries's name for this plant is excluded by *H. ferrugineum* Pers. Tent. Disp. Meth. Fung. 30. 1797, which was given to a resupinate species. It should be known as *H. carbunculus* Secretan, Myc. Suisse, **2**: 515. 1833.

† In the set examined the specimens are uncertain and of little value.

‡ The specimen under this number in the set examined is not *H. ferrugineum* Fr. but is a peculiar brick red plant that has been quite generally referred here. It seems probable that it is an undescribed species.

This plant has also been reported from Alabama (Earle); New Jersey (Ellis); South Carolina (Ravenel); Pennsylvania (Schweinitz); North Carolina (Curtis); Florida (Lloyd); Ohio (Lloyd). I have not seen the last three and as to the others, several are evidently the brick red species of Ravenel, while Schweinitz's plant appears to be the same as *H. spongiosipes* Pk. Earle's Alabama plant appears to correspond closely to Fries's description and figure. *H. ferrugineum* Fr. would seem to be positively distinguished by the unique blood-red drops that gather on the pileus and which in drying leave a dark varnished coating on the plant.

19. HYDNUM SPONGIOSIPES Peck, Reg. Rep. **50**: 111. 1897

TYPE LOC.: Round Lake, N. Y. (Peck); New Jersey (Ellis); Ohio (Morgan); Iowa (McBride); Alabama (Atkinson). This plant has been uniformly reported as *H. velutinum* Fr. but Peck is undoubtedly correct in describing it as a distinct species. The hard central portion distinct from the spongy-tomentose exterior both of stem and pileus gives a marked character to the plant. Uniform cinnamon brown throughout, the pileus 3–10 cm. broad.

20. HYDNUM AURANTIACUM (Batsch) A. & S. Conspectus Fung. Nisk. 265. 1805

ICON.: Batsch, Elench. Fung. **2**: *pl. 40. f. 222!;* Bresadola Fung. Trid. *pl. 142.*

EXSICC.: Roumeguere, Fung. Select. 5329 and 6635; Sydow, Myc. March. 811. The latter is somewhat doubtful.

TYPE LOC.: European.

New York (Underwood); New Jersey (Ellis); Alabama (Earle); Pennsylvania (Schweinitz). Also reported, but the specimens not seen from: New England (Sprague); South Carolina (Curtis); Rhode Island (Bennett). This species is well marked by its woody texture and bright orange color, which is quite permanent in the interior, but varies considerably on the exterior. There is little doubt that the plant should be known as *H. floriforme* Schaeffer, Fung. Bav. et Pal. Icon. **4**: 97. *pl. 146. f. 1–6.* 1774. Both figures and description correspond well to this plant. Persoon in Commentarius 57. 1800, identified Schaeffer's figures with *H. suberosum* var. *β aurantiacum* Batsch, and

named the plant *H. hybridum*. Fries, likewise, regarded these figures of Schaeffer as representing *H. aurantiacum* Sys. Myc. **1**: 403. 1821.

I have seen specimens of the plant with the same turbinate pileus as shown in part of Schaeffer's figures though the more common form appears to be the concave or infundibuliform pileus shown in others of his figures. That the two forms should be treated as distinct species, as was done by Persoon, seems very doubtful.

21. HYDNUM SCROBICULATUM Fries, Obs. Myc. **1**: 143. 1815

ICON.: Fries, Icon. Select. Hym. *pl. 5. f. 1!!*; Britzelmayer, Hym. Südb. *Hydnei f. 8.*

EXSICC.: Romell, Fung. Scand. 19; Roumeguere, Fung. Gall. 3007, 3626.

New York (Cushier); New Jersey (Ellis); Rhode Island (Bennett). The last reported as *H. subsquamosum.*

The plant is closely related to *H. zonatum* Batsch, from which it is difficult to separate it absolutely. The more typical forms have the surface of the pileus roughened and broken up into a coarse, spongy or scaly mass. But in other forms this feature becomes a mere roughening of the surface which also appears obscurely zonate, thus forming an easy transition to *H. zonatum.*

22. HYDNUM ZONATUM Batsch, Elench. Fung. 111. 1783

Icon.: Batsch, Elench. Fung. **2**: *pl. 40. f. 224 a, b, c!*; Nees, Sys. Pilz. *pl. 32. f. 242.* *

EXSICC.: Ravenel, Fung. Car. **1**: 25.

TYPE LOC.: European.

Connecticut (Underwood); Rhode Island (Bennett); New Jersey (Ellis); South Carolina (Ravenel); Ohio and Kentucky (Morgan); Alabama (Underwood). Specimens also reported but not examined from Florida (Calkins).

The typical form of this species is clearly marked and readily recognized by its infundibuliform, coriaceus pileus, with several sharply defined zones, by its soft cinnamon brown color, and by its

* This is of no value. *α* and *β* are mere copies of Schaeffer's figure of *cyathiforme*, while B is a copy of Batsch.

sterile margin, which does not curl in drying. But from this it varies in numerous ways forming intermediate series that connect it so closely with other species, particularly *H. scrobiculatum*, that it is very difficult to say where the line should be drawn between them. The plant should receive careful field study, and its variations noted, especially in single gatherings, where there is reason to believe the plants have all sprung from a common mycelium.

23. HYDNUM CONFLUENS Peck, Reg. Rep. **26**: 71. 1874

TYPE LOC.: New Scotland, N. Y. (Peck).

The plant has not been reported by any but its discoverer. "Pileus thin, tough, expanded, sometimes confluent, hygrophanous; stem surrounded below by a dense myceloid tomentum." Pileus 5–8 cm. wide. This is not the same as *H. concrescens* var. *confluens* Pers. Myc. Eur. **2**: 165. 1825 so that the present name cannot hold.

24. HYDNUM CORIACEO-MEMBRANACEUM Schweinitz, Syn. N. A. Fung. 162. 1834

TYPE LOC.: Bethlehem, Pa. (Schweinitz).

This plant has never been reported since Schweinitz described it. The type specimen in the Schweinitz collection in the Philadelphia Academy of Science is unfortunately totally destroyed Berkeley and Curtis, who saw the specimen in 1855, reported that it was "a very singular and distinct species" in their commmentary on the Syn. Fung. Amer. Bor.* Schweinitz himself remarks "distinctissima species." It would be especially interesting if this apparently clearly marked species could be rediscovered. The original description is added, therefore, as it is not generally accessible.

"Pileis concrescentibus, lato-repandis, subinfundibuliformibus, coriaceo-membranaceis, exacte *Polypori versicoloris* substantia in varietati ejusdem membranacei ceterum glabris, strigoso-zonatis margine strigoso fimbriatis, saepe laceratis, 1–2 uncialibus diametro, pallide cervinis. Subulis sparsis, subulatis, longis saepe tortis, lutescentibus. Stipitibus tenuibus, centralibus, brevibus, concrescentibus." Syn. N. A. Fung. 162. 1834.

* Jour. Acad. Sci. Phila. II. 3: 215. 1855.

25. HYDNUM FASCIATUM Peck, Reg. Rep. **41**: 78. 1888

TYPE LOC.: Catskill Mts., N. Y. (Peck).

The species has been reported only by its discoverer. It is a very distinct and beautiful species. "Pileus thin, coriaceous, nearly plane, umbilicate, blackish-brown, adorned with three to seven narrow elevated scabrous tawny-gray concentric zones," 1.5–2.5 cm. wide.

26. HYDNUM CYATHIFORME Schaeff. Fung. Bav. et Pal. **4**: 93. 1763

ICON.: Schaeffer, Fung. Bav. et Pal. Icon. *pl. 139!!.*

Bulliard, Herbier de la France *pl. 156?* Flor. Dan. *pl. 1020. f. 2?* Harzer, Naturg. Abb. Pilze *pl. 3. f. 1–5?* Sicard, Hist. Nat. Champ. *pl. 58. f. 294?* Britzelmayer, Hym. Südb. *Hydnei f. 9?* Schaeffer's figures are clearly marked and readily identify the plant, the others are all doubtful and most of them appear to represent a totally different plant.

EXSICC.: Krieger, Fung. Sax. 906; Sydow, Myc. March. 206 and 1011; De Thümen, Myc. Univ. 207;* Rabenhorst, Fung. Eur. 611* and 2304;* Herpell, Samml. präp. Hutp. 115; Roumeguere, Fung. Gall. 2306.†

TYPE LOC.: European.

New Hampshire (Minns); Connecticut (Underwood). It has also been reported but specimens not seen from Rhode Island (Bennett) and California (Harkness). The Schweinitzian specimens reported from South Carolina and Pennsylvania are not *H. cyathiforme* Schaef. but appear intermediate between *scrobiculatum* and *zonatum*, having the fertile curling margin of the former but the distinct zonations of the latter. The specimens are marked "(H. scrobiculatum) Epic. 21. Hydnum cyathiforme Bull."

H. cyathiforme Schaeff. is often regarded as a synonym of *H. tomentosum* L. (see De Thümen and Rabenhorst above). But for the present it seems best to follow Fries in keeping them distinct, although, I admit, the reason for doing this is chiefly the fact that Linnaeus's two-line description is not sufficient to identify any-

* These specimens are marked *H. tomentosum* L. but are typical plants of *H. cyathiforme* Schaeff.

† Roumeguere's specimens are practically worthless for critical purposes.

thing, while Schaeffer's plant is readily recognized from his figure and is clearly characterized by the white or cream colored teeth, the darker zonate pileus, somewhat tomentose at the center, and with margin the color of the teeth. The pilei are frequently confluent, forming a thin expanded crust supported by the slender distinct stems.

27. HYDNUM DELICATUM Schweinitz, Syn. N. A. Fung. 161. 1832.
Not *H. delicatum* Klotsch.

TYPE LOC.: Bethlehem, Pa. (Schweinitz).

This species has not been reported except by its discoverer. The type specimen in the Schweinitz collection at Philadelphia is partly destroyed, but sufficient remains to show the chief characters of the plant. It is a very dainty little species, 1.5–2 cm. high, ash-gray in color; pileus thin, flat to infundibuliform; stem attenuate to the base. A plant in the Ellis collection at the N. Y. Botanical Garden marked *H. suffocatum* is to all appearances this species and so gives another station, Newfield, N. J.

28. HYDNUM CANUM Schweinitz, Syn. Fung. Car. 77. 1818

TYPE LOC.: North Carolina (Schweinitz).

Also reported from Bethlehem, Pa. (Schweinitz).

The species has never been reported by any other than Schweinitz himself. His description is too brief to convey any definite idea of the species. Fries regarded the plant the same as *H. gracile* with a confidence that would indicate he had seen something more than Schweinitz's three-line description. The specimen in the Schweinitz collection at Philadelphia, while not very satisfactory, appears to be a plant closely resembling *H. scrobiculatum* in all important features except that the color is ash-gray.

SPECIES DUBIAE

29. HYDNUM FUSIPES Pers. Myc. Eur. **2**: 162. 1825

ICON.: Pers. *op. cit. pl. 20. f. 4–6.*

TYPE LOC.: European.

Bethlehem, Pennsylvania (Schweinitz). Has never been reported except by Schweinitz. His specimen as preserved in the Philadelphia Acad. of Sci. does not in the least resemble Per-

soon's figure and appears to be an immature plant of some sort. The decidedly decurrent teeth would seem to distinguish the species well and it is doubtful if it has ever been found in this country.

30. HYDNUM VERSIPELLE Fries, Ofvers. af Kongl. Vet. Ak. Förhand. 1861 : 73. 1862

ICON.: Fries, Icon. Select. Hym. *pl. 11.*

TYPE LOC.: European.

This species has been reported but once. New York (Fairman). I have seen only a single specimen of this collection but doubt if it is *H. versipelle*. The plant seen does not show in the least the confluent cespitose character emphasized by Fries both in his description and in his figure.

31. HYDNUM TOMENTOSUM L. Sp. Pl. **2** : 1178. 1753

ICON.: Smith, Seeman's Jour. Bot. **6** : *pl. 76.*

TYPE LOC.: European.

This has been reported only by Schweinitz. His specimen in the Philadelphia Academy is now only a scrap but is clearly not *cyathiforme* Schaef. nor does it resemble *H. tomentosum* L. as figured by Smith, *loc. cit.* It seems safe to assume that *H. tomentosum* L., if we are to regard it as distinct from *H. cyathiforme* Schaeff., has not been found in this country.

32. HYDNUM COMPACTUM Persoon, Comm. Schaeff. 57. *pl. 146. f. 1, 2, 3, 5, 6.* 1800

TYPE LOC.: European.

Reported from South Carolina (Curtis) and North Carolina (Schweinitz). No species of the genus seems to be more uncertain than this. An examination of specimens from collectors in this country, as well as a study of European exciccati, reveals a very great difference of conception as to the characters of the species; even published descriptions are difficult to harmonize. An appeal to Persoon's original description does not give much help in the matter. He established the species on part of Schaeffer's figures of *H. floriforme*, the turbinate forms of *pl. 146. f. 1, 2, 3, 5, 6*, and gave a very meager description, but one that differs essentially from Schaeffer's account of *floriforme*. As there is no good reason to suppose Schaeffer's figures did not correctly represent the

plant he described, we are left not only in doubt, but in some confusion as to what plant Persoon may have had in mind. A plant from Alabama, in the Underwood collection, conforms quite closely to Persoon's description and resembles in form Schaeffer's figures, but does not correspond to any known European plant. It is doubtful, therefore, whether it should be regarded as *H. compactum* Pers. Moreover, it does not show the blue variegations mentioned by Fries, a characteristic which is quite evident in some of the European specimens. I have not seen Curtis's specimens, while Schweinitz's plant as preserved at Philadelphia is very curious and distinct from anything I have seen. I believe we have several unique species in this country passing under the name of *H. compactum.*

33. HYDNUM CINEREUM Bull. Herbier de la France, 309. 1791

ICON.: Bulliard Herbier de la France, *pl. 419!;* Sicard, Hist. nat. Champ. *pl. 58. f. 297.*

TYPE LOC.: European.

Bethlehem, Pa. (Schweinitz). Has been reported only by Schweinitz and his specimen is too uncertain to draw any conclusions. In the absence of actual specimens it is impossible to satisfactorily locate this plant. It is doubtful if this species has really been found here.

34. HYDNUM MIRABILE Fries, Monog. **2**: 349. 1863

ICON.: Fries, Icon. Select. Hym. *pl. 3. f. 2!.*

TYPE LOC.: European.

Port Jefferson, N. Y. (Peck). This species has been reported only by Peck and he expresses doubt as to whether his specimen is rightly referred here. The plant is characterized by a peculiar woolly tomentum covering the entire plant.

35. HYDNUM VELUTINUM Fries, Sys. Myc. **1**: 404. 1821

ICON.: Bulliard, Herbier de la France *pl. 453. f. 2.*

TYPE LOC.: European.

All specimens reported as *H. velutinum* that have been examined have proven to be *H. spongiosipes* and it is probable that the latter species has been generally referred to *velutinum.* Curtis's North Carolina specimen has not been seen.

36. HYDNUM CONCRESCENS Persoon, Obs. Myc. 1: 74. 1796

TYPE LOC.: European.

North Carolina (Schweinitz).

Schweinitz is the only one who has reported a species under this name. Later in his Syn. N. A. Fung. 161 he referred the same plant to *H. cyathiforme* Fr. As *H. concrescens* Pers. is a doubtful species, and Fries himself afterward repudiated his own *H. cyathiforme* it is difficult to say what Schweinitz's plant may have been. There is no specimen in his collection at Philadelphia.

37. HYDNUM FENNICUM Karst. Rev. Myc. 9: 10. 1887

TYPE LOC.: European.

Port Jefferson, N. Y. (Peck); Kentucky (Morgan).

The American plants referred to this species are somewhat doubtful but correspond closely to a specimen from Karsten himself which is preserved in the New York Botanical Garden. The plant appears to be especially marked by a dark blue color at the base of the stem.

38. HYDNUM SPADICEUM Persoon, Icon. et Disc. 34. 1798

ICON.: Persoon, *op. cit. pl. 9. f. 1.*

TYPE LOC.: European.

Reported from Rhode Island (Bennett) and North Carolina (Schweinitz). Schweinitz afterward regarded his specimen as *H. connatum* and Bennett's plant appears to have been destroyed.

39. HYDNUM CONNATUM Schultz, Prodr. Flor. Starg. 491. 1806

TYPE LOC.: European.

Reported from North Carolina (Schweinitz). The specimen in the Acad. Nat. Sci. Phila. does not seem to differ from *H. scrobiculatum.*

40. HYDNUM GRAVEOLENS Delast.; Fries Epic. 509. 1836–38

ICON.: Fries, Icon. Select. Hym. *pl. 6. f. 11.*

EXSICC.: Ravenel, Fung. Car. 3: 16; Sydow, Myc. March. 908: Roumeguere, Fung. Select. 6241; Roumeguere, Fung. Gall. 2007; Rabenhorst, Fung. Eur. 1104.

TYPE LOC.: European.

Reported also from Ft. Edward, N. Y. (E. C. Howe) and North Carolina (Curtis). I have not seen these specimens. The exsiccati quoted above furnish little information regarding this species; the American collections are of uncertain relations and it seems doubtful if the species has ever really been found in this country. Such specimens as I have been able to examine do not satisfy me as corresponding either to Fries' figure or description.

DICKINSON SEMINARY, WILLIAMSPORT, PA. March, 1901.

New Plants from Wyoming. XIII.

By Aven Nelson

Potentilla Plattensis pedicellata

Erect, slender, several-stemmed from the crown of a semi-fleshy root, bright green but under a lens silky-strigose, taller than the species (often 3 dm. high): stipules entire or cleft-toothed, ovate-lanceolate, acute: leaflets divided nearly to the midrib, the segments linear-oblong, acute or subacute: inflorescence open, many-flowered, the long slender pedicels widely divaricate: bractlets and sepals subequal: petals scarcely exceeding the sepals.

The aspect of the plants now proposed as a variety of *P. Plattensis* is so different from that of the species that I did not at first associate them with it. Closer examination shows, however, that they must be thus allied and probably best as a variety only.

Collected on the grassy banks of a mountain stream, Centennial, Albany Co., July 27, 1900, no. 7730.

Ligusticum affine

Moderately stout, .5–1 m. high, glabrous: root leaves large, including the petiole from one third to one half the length of the stems; petiole from nearly as long to much exceeding the blade; blade usually biternate, then once or twice pinnate; segments mostly ovate-oblong, deeply cleft into linear-oblong or linear-lanceolate lobes, these sometimes few-toothed: stem leaves few (1–3), much reduced, usually ternate, then pinnate, the segments more deeply cleft or even divided and with narrower lobes: umbel long-peduncled, sometimes 1–3 long-peduncled accessory umbels (inflorescence subcorymbose), many-rayed, crowded (*i. e.*, the rays suberect), with involucels of few linear-subulate bractlets which are usually early deciduous: rays (fruiting) 3–6 cm. long: pedicels 5–10 mm. long: flowers white: fruit elliptic, 5 mm. long, the ribs distinctly winged: oil tubes usually 5 in the intervals and 10 on the commissural side: stylopodium flattened-hemispherical.

This species now proposed was included in *L. simulans* C. & R., Monog. N. A. Umbel. 135, but it is no part of the type numbers there cited. The species are distinct not only by good field char-

ters but fruit characters are not wanting. It is only the ampler and well fruited specimens of the collections of 1900 (which have not yet been distributed) that makes this segregation possible.

That Dr. Rose himself was inclined to think that the material represented two species is shown by the fact that some of the numbers of the collections of 1896 and 1897 were at that time named *L. Porteri* while the specimens that he has made his type numbers were not referred to any species.

L. affine is the larger plant, with pale-green foliage in contrast to the dark-green of the others; the leaves are more decompound and the segments more deeply cleft with much narrower lobes; the naked peduncles (often subcorymbose) conspicuously surpass the foliage; the umbels are more compact; the fruits larger, broader and more evidently winged; the number of oil tubes greater (mostly 3 in the intervals and 6–8 on the commissural side in *L. simulans*). The two species grow in similar situations and at the same stations but not, so far as my observations go, commingled. My collections of them have always been kept distinct in the field. I cite 7695, Centennial, Albany Co., July 26, 1900, as type. Of the numbers named under *L. simulans* I would here refer 1784, 4175 and possibly others.

Pseudocymopterus sylvaticus

Root fleshy, cylindrical or conical, 3–10 cm. long; stems glabrous as are also the leaves, 1–2 from the narrowed crown, sheathed below by the dead, brown leaf bases, slender, erect, 3–8 dm. high (including the long naked peduncle), usually simple but sometimes with one or two slender erect branches: leaves few, oblong to ovate in outline, pinnate; the segments 5–9, mostly petiolulate, ovate in outline, 3–6 cm. long, pinnately or bipinnately cleft or parted into linear acute segments; root-leaves 10–25 cm. long, including the slender petiole which usually exceeds the balde; stem-leaves only 2–5, on successively shorter petioles: umbel 5–10-rayed, with involucels of long linear bractlets: rays 15–25 mm. long; pedicels very short: fruit broadly elliptic, 5 mm. long; lateral wings thin and as broad as the body; the dorsal and intermediate ribs thickened at base and narrowly winged, with narrow intervals; oil tubes mostly 1 (more rarely 2–3) in the intervals, 2–4 on the commissural side.

Allied to *P. montanus* (Gray) C. & R. In fact the descriptions

as drawn do not readily separate them. A considerable series of *P. montanum*, however, show the two species to be wholly distinct. The Wyoming plants when fully mature are seen to be tall slender plants, with the leaf-segments parted into long linear lobes. The peduncles are long and naked, the fruits are broader with thinner, conspicuous wings and the oil tubes are on the whole fewer. Their habitats seem to be as wholly different as their aspect. The typical New Mexican *P. montanus* occurs on "Sunny declivities at the foot of mountains," while *P. sylvaticus* is found in dense, wet or even boggy woods along streams. The young plants of *P. sylvaticus* have rather the hue and aspect of *Harbouria* than of *P. montanus*.

The type number is 7667, Tie City, Albany Co., July 20, 1900. Collected also on Saw Mill Creek, May 25, 1895, no. 1238. It seems probable that no. 217 of the Hall and Harbour collection and Professor Crandall's specimens from the mountains of Larimer Co., Colorado, July 14, 1898, may have to be included.

Musineon pedunculatum

Acaulescent or nearly so, glabrous throughout: root deep-set, 1–2 dm. long, 10–25 mm. in diameter, cylindrical or fusiform, semi-woody and covered with a thick, rough or warty bark: crown clothed with brown, scarious, nerved, lanceolate bracts: stems few (2–5), borne on a short naked foot 2–4 cm. long, the foot more or less concealed by the scarious bracts of the crown: each stem with 1 or 2 short (1–3 cm.) internodes, simple or branching at the nodes, terminated by a long naked widely divaricate or prostrate peduncle: leaves thick, somewhat glaucous, 4–8 cm. long, longer than the dilated petiole, of broad outline (oblong to ovate), usually ternate, the segments pinnate or even bipinnate, ovate in outline, the ultimate segments broad and short, variously cut or toothed: peduncles rather stout, slightly flexuous, 12–20 cm. long, much exceeding the leaves, sometimes twice or thrice as long: umbel 10–20-rayed; rays 15–25 mm. long; pedicels very short (1–4 mm.): fruits apparently smooth (not yet mature), 4 or 5 mm. long: oil tubes about 3 in the intervals, and 4 on the commissural side: seed slightly flattened dorsally, with plane face.

An undoubted *Musineon* yet more clearly distinct from *M. divaricatum* and *M. Hookeri* than they are from each other. It may be necessary sometime to slightly modify the fruit characters as given, since no fully mature fruits are at hand.

Secured on the stiff, Wasatch tertiary clays (almost devoid of other vegetation) at the Bush Ranch, near Steamboat Mt. in Sweetwater Co., June 10, 1900, no. 7093.

Musineon trachyspermum. I doubt if the reduction of this Nuttallian species to a synonym of *M. Hookeri* is justifiable. Among the specimens at hand from the interior desert region of Wyoming is one from the clay hills in the vicinity of the Platte River that answers well to the description in T. & G. Fl. 1: 642. It has been distributed under no. 4853.

Lomatium purpureum

Root thick, semi-woody, vertical, 1 dm. or more long, 1 cm. (more or less) in diameter: leaves all basal, wholly glabrous, ternate and each division pinnate or bipinnate; the ultimate segments small, from oblong to linear, 5–8 mm. long, obtuse or subacute; the primary petiole 5–9 cm. long, about as long as the rest of the leaf, purple as are also the peduncles: scapes (peduncles) glabrous, 10–20 cm. long, exceeding the leaves: umbel unequally 7–10-rayed, the younger and shorter ones often aborting: involucre wanting; involucels of oblong, acute, green bractlets: rays 5–30 mm. long: flowers yellow, pedicels very short, in fruit only 1–3 mm. long; fruit glabrous, elliptic, 5–7 mm. long, the wings half as wide as the body, the dorsal and intermediate ribs evident, acute or even narrowly winged: oil tubes 1–3 in the intervals, 4–6 on the commissural side.

The specimens upon which this species is based were collected in the Yellowstone Park in 1899 and distributed under a herbarium name in the sets of plants from that region.

At that time I thought it a *Peucedanum* and I still see no reason for changing that opinion except, of course, to adopt the name *Lomatium* which Drs. Coulter and Rose have shown to be the proper and tenable name of a large part of our west-American plants that have so long been known as *Peucedanum.** In the monograph cited, one of the numbers (5496) distributed is referred to *Pseudocymopterus montanus* (Gray) C. & R. but on what ground is not clear. Habital and fruit characters are certainly those of *Lomatium.* The thin coherent lateral wings, the strengthening cells beneath each rib and the obsolete calyx teeth point to this rather than any other genus. In habit is much like *L. orientale*

* Monog. N. A. Umbel. 204.

C. & R., L. *Nevadense* (Wats.) C. & R. or *L. Cous* (Wats.) C. & R. but it has nearly the fruit of *L. circumdatum* (Wats.) C. & R. Like that species it shows a tendency in the dorsal and intermediate ribs to become narrowly winged and the seed is somewhat concave on the face with a central ridge.

The collections of it are all from Yellowstone Park as follows: 5496, Madison Cañon, June 25; 5611, Glen Creek, July 1; 6720 (type), Dunraven Peak, Aug. 27. It occupies open, stony or gravelly ridges at 6000 to 9000 ft. altitude.

Dodecatheon philoscia

Glabrous throughout: scape 1.5–3 dm. high, very slender, mostly 1–3-flowered though sometimes with more, from a short cormose-rootstock with fibrous roots: leaves few (4–8), elliptic to oblong, mostly obtuse, variable in size (2–7 cm. long), tapering into a short slender petiole: bracts minute, oblong: calyx-lobes lanceolate, 2–3 mm. long, twice as long as the tube: united part of the corolla with a purple wavy line; lobes deep sky-blue, narrowly oblong, 15 mm. long, about 3 mm. broad, obtuse: united filaments about 1 mm. long, yellow: anthers broadly subulate, acute, deep-blue on the back, about 5 mm. long; connective linear-acuminate: capsules on slender erect pedicels (which are 2–4 cm. long), subcylindric, about 4 mm. in diameter and 1 cm. long, twice as long as the calyx, splitting only at the summit into five (at length) divergent teeth.

I am at a loss to know to what species this is most nearly allied. On account of the few, broad, thin (almost membranous when dry), entire, widely spreading leaves it cannot be compared with *D. pauciflorum* (Durand) Greene from which its short filaments also separate it.

It perhaps may be best compared with the *D. Media* of the eastern states from which its smaller size, slender scape and pedicels, slender petioles, few flowers and different capsule separate it.

It was secured on gravelly and stony, shaded bars in the river bed at Jelm (Laramie River), Aug. 11, 1900, no. 8063.

Swertia palustris

Stems simple, erect, glabrous, 2–3 dm. high: leaves glabrous, thin, almost membranous when dry, entire or rarely denticulate: root-leaves oblong to elliptic, usually very obtuse, 5–10 cm. long, on margined petioles somewhat shorter; stem-leaves several, gen-

erally in pairs but not rarely alternate, spatulately oblanceolate or broader, tapering gradually into the broad margined petiole which becomes gradually shorter upward and absent in the uppermost: inflorescence very strict: peduncles erect, axillary to the bracts and uppermost leaves, 1–3-flowered: flowers 5-merous: sepals subulate-lanceolate, delicately nerved, about half as long as the petals: corolla lobes dark blue shading to purple, oblong, obtuse, about 10 mm. long, 3–4 mm. broad: glands orbicular, the appendages few (10 or less), short subulate: seeds seemingly lenticular (those at hand immature), wing-margined.

It often happens, once attention is called to it, that some species that has remained a long time generally accepted and undisturbed is found to be a very nicely separable aggregate. Dr. Greene and others have repeatedly made this clear. As soon as segregation has begun other workers must of necessity investigate their own material and at the same time it stimulates the field work in that particular group. This nearly always leads to the definition of yet other species. Evidently this experience is to be repeated in the case of *Swertia*. The old world *S. perennis* is wholly unknown to me but, with the characters which Dr. Greene assigns to it * it is no longer possible to refer any of our forms to that. In fact to do so would be to reject the work already done. But if we accept the characters, upon which Dr. Greene's species † are founded, as specific, it is equally impossible to include some other Rocky Mountain forms in them. *S. palustris* is nearest to *S. scopulina* but differs from it in its leafy stems, more numerous 5-merous flowers, shorter sepals and apparently very different seeds.

The species now proposed is abundant in shaded subalpine bogs of southern Wyoming. I cite no. 7774, Nash's Fork, July 30, 1900, as type.

Swertia congesta

Commonly less than 2 dm. high: leaves alternate, rarely more than 3 or 4, usually on the basal half of the stem (the upper half somewhat scapiform), from elliptic to oblanceolate, obtuse or subacute, 3–6 cm. long, sessile or on short margined clasping petioles: inflorescence congested, usually subtended by a pair of foliar bracts: flowers 5-merous, 3–7, dark bluish-purple: sepals as in

* Pittonia 4: 184

† Pittonia *l. c.*

the preceding: corolla lobes elliptic, obtuse, usually emarginate, 8–10 mm. long, nearly half as broad; glands cup-shaped, the setaceous appendages as long as the cup: filaments flat and thin, their bases involved in a ring of very short, sparse, subulate setae in the base of the corolla: seeds small, very numerous, irregular (?), narrowly wing-margined on the angles.

Readily distinguished from the preceding by its smaller size, alternate leaves, congested inflorescence and the ring of setae in the base of the corolla.

It occurs at higher elevations than the preceding, being alpine or nearly so, and in open wet grassy swales. The type no. is 7852, Medicine Bow Mts., Aug. 1, 1900.

Phacelia Knighti

A diminutive annual, 2–5 cm. high, minutely puberulent, scarcely viscid, simple or branched: leaves few (5–10?), semi-fleshy, orbicular to ovate, entire or nearly so, 5–10 mm. long: flowers few, subspicate and nearly sessile in the uppermost axils: corolla narrowly campanulate, about 5 mm. long, ⅓ longer than the linear-spatulate calyx lobes, the limb purple, the tube yellowish, the appendages of the tube narrowly linear: seeds about 14, oblong, large for the plant, conspicuously alveolate-hexagonal-reticulate, slightly wing-margined by the cellular coat.

While this species is probably nearest to *P. cephalotes* Gray yet it can hardly be compared with it and may be best looked upon as a strictly coördinate member of that section of *Phacelia* containing those 4 or 5 species which are peculiar to the arid interior West. It is a vernal species following closely upon the melting of the spring snows. The specimens at hand were secured upon the absolutely naked (to all appearances) slopes of the Wasatch clays in Sweetwater Co., June 10, 1900 (no. 7118). The tiny plants occurred only in the cracks in the loose soil and were detected by Professor W. C. Knight to whom the species is dedicated.

Asclepias curvipes

Root thick and woody: stems usually several, from ascending to nearly erect, 4–8 dm. high, simple, obscurely puberulent, becoming glabrous: leaves opposite or sometimes the lowest alternate, ovate-lanceolate, obtuse or acute, minutely and softly pubescent on the lower face, glabrate on the upper, 7–15 cm. long, short-peduncled, exceeding the short internodes: umbels mostly simple, few: peduncles 3–7 cm. long, axillary from the only

slightly reduced uppermost leaves: pedicels slender, 15–20 mm. long: sepals lanceolate, 3–4 mm. long: corolla purple; its lobes ovate-elliptic, obtuse and usually emarginate, twice as long as the sepals: hoods yellowish with purple center, ovate, obtuse, the base slightly narrowed, as long as the corolla lobes, exceeding the strongly incurved, sickle-shaped horn: anther wings broad and unappendaged: follicles lanceolate-acuminate in outline, 7–10 cm. long, erect on the sharply deflexed fruiting pedicels, mostly densely white tomentose and with a lighter tomentum on the pedicels and peduncles.

In 1895 I collected this species in flower at Wood's Landing (no. 1556) and determined it as *A. Hallii* Gray. In 1900, I secured the same plant in fruit from the same locality (no. 8191). I am now convinced that, while it is related to *A. Hallii*, the relatively long peduncles, the somewhat differently colored flowers, the broader corolla lobes and hoods, the absence of the double gibbosity in the hoods, the sharply deflexed pedicels and the decided tomentum on the erect follicles easily separate it.

Pentstemon exilifolius

Stems several to numerous, from a tufted, usually much branched caudex from which spring numerous thickened-fibrous roots, glabrous, as are also the leaves and inflorescence, 1 (rarely 2) dm. high: leaves very numerous, crowded on the crowns, narrowly linear, channelled or involute, subulate-pointed, 15–25 mm. long; stem-leaves opposite, similar, passing into the smaller bracts: thyrsus narrow (approaching a raceme), crowded, few- to many-flowered; pedicels slender: sepals ovate-acuminate, the acuminations green, the body scarious-margined: corolla white, tubular-funnelform, 12–15 mm. long, obscurely pubescent in the throat, scarcely bilabiate, the nearly obicular lobes widely spreading, 6–7 mm. long: anthers glabrous, the sterile filament scarcely dilated, very stiffly and densely short pubescent.

This species has been considered as *P. laricifolius* Hook. & Arn., a species published in Bot. Beechy's Voyage from Snake Fort. Certain plants from the interior of Wyoming, closely allied, were included by Dr. Gray in the description as drawn for the Syn. Fl. The Wyoming specimens that I have seen are clearly distinct. *P. laricifolius*, the original description shows, has obtusish shining leaves; the corolla is ventricose; both the lip and throat are pilose as is also the sterile filament. In *P. exilifolius* the corolla is almost glabrous and the sterile filament re-

minds one of a diminutive tooth brush. In fact *P. exilifolius* is more nearly allied to *P. aridus* Rydb. of Montana though specimens and descriptions show these also clearly distinct.

This species is common on dry stony plateaus in southern Wyoming and has been distributed by me as *P. laricifolius* under the following numbers: 419, 1442, 5015 and 7460. The latter is taken as the type and is from Halleck Cañon, July 6, 1900.

Pentstemon exilifolius desertus

Quite similar; the leaves broader; calyx purplish; corolla purple; pubescence in the throat yellow, stiffer than in the species.

This variety occurs sparingly on dry sandstone ridges in the Red Desert. Point of Rocks, June 12, 1900, no. 7160.

Castilleja collina

Many stemmed from a short caudex with an enlarged crown, 15–25 cm. high (the plant often as broad): the roots usually numerous, yellowish, thickened, semi-fleshy: pubescence a fine puberulence with some soft white woolly hairs at the base of the leaves, on their margins and in the inflorescence: stems simple, the exterior ones in the cluster decumbent: leaves 2–4 cm. long, dark green, variously cleft; the lower mostly pinnately, with the body narrowly lanceolate and cuneate at the base, the divaricate lobes linear or broader, sometimes again cleft, 1–3 on either side; the upper similar but with the undivided center becoming broader (oblong or broader): bracts bright red, more freely cleft than the leaves, as large or larger: calyx sparsely soft pubescent, cleft nearly to the middle before, less deeply behind, the lobes again cleft half their length into lanceolate segments: corolla yellowish, about 3 cm. long; galea distinctly exceeding the tube, slender, truncate or with a short tooth at apex, obscurely pubescent on the exserted tip; lip very short, 3-toothed, the central one short, the lateral longer, acute, divaricate.

This species is common in southeastern Wyoming on gravelly, granite slopes. It has often been collected, the earlier specimens having been disturbed as *C. parviflora*. Later it has been disposed of (under protest) as *C. angustifolia* (Nutt.) Don. From this it differs in its broader, always cleft leaves, its shorter inflorescence (short even in fruit), in its unequally cleft calyx, in its galea which exceeds the tube and in its characteristic lip. The color, too, is not the scarlet varying to yellow that occurs in *C. angustifolia*.

The type no. is 6995, Sand Creek, May 31, 1900.

Valeriana furfurescens

Root fleshy, smooth, vertical, cylindro-conical, 1–2 dm. long, usually only 6–12 mm. in diameter, but slightly enlarged at the crown: stems singly (rarely more) from the crown, strict, slender, striate, glabrous, 5–10 dm. high including the long inflorescence: leaves largely basal, all narrow, glabrous except for a minute puberulence on the margins and sometimes on the veins: root-leaves linear-oblanceolate, entire (seemingly always so), acute at apex, tapering gradually into a slender, scarcely margined petiole, 10–20 cm. long including the variable petiole (petiole usually much shorter than the blade); stem-leaves few, entire or with a few approximate lobes, with broader, shorter, often connate petioles: bracts linear: bractlets minute, ovate, acuminate, scarious margined: inflorescence a greatly elongated open-paniculate cyme, often more than half of the height of the plant: flowers exceedingly minute, light yellowish-green, very numerous; corolla 1–1.5 mm. long, the ovate-orbicular lobes about equalling the campanulate tube: stamens 3, included, nearly sessile: fruit about 3 mm. long, ovate, compressed, glabrous but minutely scurfy-rugulose, or in age merely splotched with brown.

This excellent species finds its nearest ally in *V. edulis* Nutt. but the specific distinctions are so evident that it is almost unnecessary to direct attention to them. The enormous root, the pubescent, semi-fleshy, pinnate leaves, the less open inflorescence, the relatively large white flowers and pubescent fruits of *V. edulis* will at once separate them.

V. furfurescens was secured in a small grassy mountain valley where it occurred in the greatest abundance and seemed to be unusually uniform in aspect and size of all the organs characterized. Chug Creek, near Iron Mountain Station, July 2, 1900, no. 7381.

Chrysopsis resinolens

Perennial, green and resin scented: root woody, conical, the expanded crown bearing few to many ascending or suberect stems: stems 2–4 dm. high, very leafy especially upward, sparsely hispid-ciliate and minutely glandular or resinous: leaves numerous, erect or but slightly spreading, with minute, gland-tipped hairs or dotted with resinous particles, hispid-ciliate especially on the margins; the lower dead and falling away at anthesis; narrowly oblanceolate, on short, hispid-ciliate petioles; the upper sessile, narrowly oblong or subspatulate, 3–5 cm. long, obtuse or subacute, apiculate: inflorescence terminal, crowded,

very leafy, densely but finely glandular, the leafy bracts hispid-ciliate on the margins; heads few (3–10), rather large, paniculately-corymbose: involucre broadly campanulate, 1 cm. high, green, granular-resinous, ciliate-pubescent; bracts linear-acute, in 3–4 rows, the inner equalling the disk: rays 20 (more or less), deep yellow or orange colored, 8–12 mm. long: pappus dingy, the outer series distinct, of short, narrow scabrous-margined paleae.

The nearest ally of this species seems to be *C. viscida* (Gray) Greene, which has a more southwesterly range. That differs from the species now proposed in its strongly decumbent, rigid stems, its smaller size, smaller and fewer leaves, and open, branched inflorescence. In many respects *C. resinolens* is nearer *C. fulcrata* Greene from which, however, a comparison of specimens shows it to be amply distinct.

Collected on open slopes in the foothills of Laramie Peak, Albany Co., July 13, 1900. The type number is 7583.

Chrysopsis resinolens ciliata

Smaller than the species, the stems more numerous and crowded on the crown; leaves nearly glabrous on the faces but conspicuously ciliate margined, closely and minutely glandular-dotted; heads fewer, closely crowded and subtended by leafy bracts: rays broader and fewer: the outer pappus shorter and of fewer paleae.

Collected on sandy river banks, Dunn's Ranch, Albany Co., July 16, 1900, no. 7560.

Machaeranthera ramosa

Perennial from rather deep-set woody roots: stems several to numerous, prostrate-spreading or somewhat assurgent, each freely branched (often intricately so) throughout, 3–4 dm. long, the whole plant forming a conspicuous mat from .5 m. to nearly 1 m. across, stems and slender branchlets green with a fine puberulence: leaves green, nearly glabrous; the radical and cauline entire or irregularly denticulate, broadly linear or linear-spatulate, 3–5 cm. long, often wanting at anthesis; the rameal numerous, small, linear, entire or nearly so, often somewhat fascicled: heads numerous, terminating the branchlets; involucres broad, subhemispherical, the lanceolate bracts in 5 or 6 series and rather loosely imbricated, the green, acuminate tips at length reflexed, distinctly glandular-viscid (the peduncular branchlets only slightly so): rays 20 (more or less), purple: akenes compressed, greenish, thinly and finely pubescent.

Some years since a large number of specimens of this species were distributed (partly through the Minnesota Exchange Bureau) as *Aster canescens viridis* Gray, under nos. 1150 and 2788. More recently it has been distributed as *Machaeranthera canescens* (Pursh) Gray, which it is a long ways from being. It is, possibly, nearer to *M. viscosa* (Nutt.) Greene, but from that also it is at once separated by its habit. From the former by the pubescence; the number and the position of the involucral bracts, and the color of the rays. From the latter by the shape of the involucre and akenes. The species may be somewhat local. It is abundant in certain localities on the Laramie Plains but I have never collected it outside of this range. I cite as type number 8152, Laramie, Aug. 27, 1900.

Rudbeckia ampla

Perennial, from horizontal rootstocks with large fleshy crowns from which spring numerous semi-fleshy roots: stems clustered, *i. e.*, several from the same tuft, 1–2 m. high, glabrous, strongly striate, moderately branched above: leaves numerous and ample, light green and glabrous below, a shade or two darker above with minute scattering hispid hairs from pustulate bases (the hairs sometimes deciduous), with conspicuous, light-colored veins: basal leaves large, 2–3 dm. broad, trifoliate, on petioles 2–4 dm. long: the leaflets petiolulate, broadly oval or ovate in outline, three-cleft, the segments coarsely and irregularly serrate, the middle segment often again lobed or cleft: lower stem-leaves similar but smaller, the petioles becoming slenderer and shorter upward, the leaves merely 3-parted: upper stem-leaves sessile, 3-parted or merely cleft, 1–2 dm. long; the segments becoming entire as to margin, the lateral oblong-lanceolate, the middle variously toothed and cleft: rameal leaves reduced, becoming entire and bract-like, from broadly oval-acute to lanceolate: heads terminating the branches, large: involucral bracts oblong to ovate, obtuse or subacute, 8–12 mm. long: rays 6–12, conspicuous, 3–5 cm. long, 8–15 mm. wide: disk in full anthesis and in fruit cylindrical-ovate, 2–4 cm. high.

That this is in part the *R. laciniata* of Gray's Syn. Fl. 262 is possible but it is far from the typical eastern *R. laciniata* L. The pinnately arranged narrow segments with wide sinuses of the smaller leaves of that, need but to be compared with the trifoliate-palmate broad segments and narrow sinuses of this to see that they are distinct. The larger rougher disk, the fewer and stouter

peduncles and the different involucral bracts are equally characteristic of *R. ampla.*

Whether all the Rocky Mountain forms belong here I am unable to say, but I would include Baker's no. 699, Pagosa Springs, Colo.; 224, Jennie M. Archibald, Berwind, Colo.; and all my numbers as follows: Eagle Rock Cañon, Aug., 1891; no. 1575, Cotton Wood Cañon, Aug. 5, 1895; no. 7709, Centennial, July 26, 1900.

Contributions to a better Knowledge of the Pyrenomycetes.—II.

A NEW SPECIES OF ERGOT

By David Griffiths

After being led to believe that the fungus flora of the arid regions of southern Arizona was next to nil, the writer, while on a short trip in the San Pedro and Sulphur Spring Valleys, was more than pleased by finding several very interesting parasitic things as common and, in places as abundant, as in the moister and cooler regions of the North and the East. The principal object of the trip was the acquisition of seeds of native forage plants for experimentation. The greater number of the fungi secured were therefore, naturally associated with forage plants. No less than a dozen smuts and a much larger number of rusts were found in a short two-week trip. As far as the material has been studied, the most interesting parasitic fungus secured is a species of *Claviceps*, the description of which is the occasion for the present paper. A few general remarks on some of the characteristics of the parasitic fungus flora of the portions of the two valleys visited, together with that of the Santa Cruz in the vicinity of Tucson will be of some interest, and, possibly, pave the way for future publications.

It should be stated that the Sulphur Spring Valley is a basin rather than a valley and is of about 2000 feet greater altitude than the Santa Cruz, while the San Pedro is approximately an average between them. On account of the excessive drouths of the summer of 1900, the Santa Cruz was, during the month of October, almost devoid of the more valuable nutritious grasses. The Sulphur Spring, on the contrary, had a luxuriant growth of *Bouteloua*, *Aristida*, *Hilaria*, *Pappophorum*, *Chloris*, *Triodea*, and *Andropogon*. The San Pedro was about an average between the two. It is needless to state that the condition of the vegetation was a good index to the amount and the character of the precipitation which had occurred since the middle of July. The grasses which grew in such abundance in the higher valley occurred commonly

in each of the others but in diminishing quantities westward. The smuts with which the grasses were as badly affected in the higher altitudes were next to absent in the lower drier areas about Tucson in the Santa Cruz. Only one species of the smuts mentioned, and this in very small quantity on a single host, was found in the latter locality. This species was found in two stations near Tucson, one a poorly cultivated, irrigated field and the other a broad shallow wash on the mesa, which received the drainage of a considerable area. The hosts were common, however, in places within a radius of ten miles of Tucson. I think I have never met with a more striking example of the effect of drouth on the development of the smuts of native grasses.

It must also be borne in mind that the period of development of the parasitic fungi of this region is much shorter than it is in the regions favored with a more equable distribution of rainfall. Some of the hosts grow up and mature their seed in the short period of two months after the advent of the summer rains. The life of the fungus must likewise be subjected to the same shortening process. Indeed the parasitic fungi like their hosts necessarily spring into activity when the summer rains come and follow the advent of this agency as much as they do the seasonal variations of temperature.

These remarks are equally applicable to the species of ergot in question. There was plenty of the host (*Hilaria mutica*) of this interesting species found in the vicinity of Vale in the Santa Cruz valley, but careful search was required in order to ascertain the presence of sclerotia upon it, while they were exceedingly abundant wherever the host was found in the Sulphur Spring Valley. The space traveled over in the *Hilaria* region of the upper valley is estimated to have extended in the aggregate a distance of at least 15 miles, where there were patches of the grass every few rods. Scarcely any of it was free from the ergot. There was one locality on the railroad right-of-way near Cochise where the fungus was exceedingly abundant. The occurrence of an acre of grass making an excellent stand of hay with scarcely a head free from ergot would represent rather the extreme for the *Agropyron* and *Elymus condensatus* regions of the Northwest. Yet this represents exactly the condition on the so-called deserts of Arizona. The

vicinity of an abandoned roadbed, while covered with a rather shorter growth of grass than the remainder of the patch, was as badly infested as any the writer has ever seen. Here there was scarcely a perfect seed produced, each being replaced by the sclerotium of an ergot. Several heads were found with as many as twenty sclerotia produced in each.

FIG. 1.

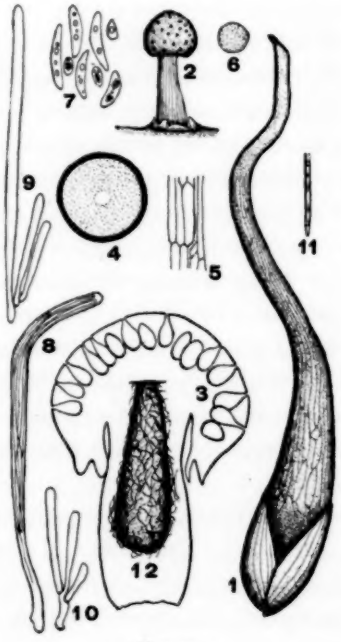

FIG. 2.

FIG. 1. Spike showing sclerotia.

FIG. 2. 1. Sclerotium, × 3. 2. Stroma, × 8. 3. Section of stroma, × 25, from microtome section. 4. Section of base of sclerotium, × 5. 5. Surface of sclerotium showing reticulations, × 8. 6. Section of sclerotium near the apex, × 10. 7. Conidia, × 285. 8. Ascus, × 285. 9 and 10. Groups of young asci, × 285. 11. Portion of a spore, × 600. 12. Perithecium, × 45.

The development of the ascosporic stage from the sclerotium is of considerable interest and importance inasmuch as the sclerotia grow readily, whereas, every botanist who has attempted to cultivate the sclerotia of the various forms of *Claviceps purpurea*, knows how difficult and uncertain is their development. It is a

matter of common observation in the arid regions of the Southwest that in a very few days after a rain, whether this comes in July or September, the mesa reveals an abundance of seedlings which spring up and grow vigorously as long as favorable conditions obtain. It is well known that the seeds of some plants, at least, will germinate immediately upon maturity in marked contrast with the period of rest required by the seeds of the majority of the natives of the cooler and moister regions. Something analagous appears to be true regarding the development of the stroma from the sclerotium of this ergot. The proper conditions of heat and moisture cause them to develop immediately upon maturity, while, as is well known, the same structures in *Claviceps purpurea* apparently require a longer or shorter period of rest.

The sclerotia of this ergot were collected on the 16th of October in a sticky viscid condition. They were removed from the glumes of the grass and planted in clean building sand in the university greenhouse on the 26th of the same month. On the 25th of November, stromata containing mature ascospores were found in abundance. Previous experience in the germination of sclerotia led me to examine the cultures but casually, because they were not expected to develop inside of about two months. Not knowing, therefore, just when the stromata first appeared in this culture another lot of sclerotia was planted on the following day. These were carefully watched and sprinkled with water once each day for twenty days when mature stromata were again secured from the most superficial sclerotia. Both of the cultures continued to produce stromata until the first of January when they were abandoned. The development of mature stromata within twenty days of planting, especially when planting follows so closely upon the maturity of the sclerotia, I believe to be out of the ordinary experience.

It will be of interest to compare the above periods of development with the following data taken from my notes upon uncom-

Host plant.	Date of Collection.	Locality.	Date of Planting.	Date of Maturity of Stroma.	Period of Development.
Setanion elymoides.	Aug. 30, '98	Billings, Mont.	Oct. 29, '98	Feb. 20, '99	114 days
Elymus condensatus.	Aug. 22, '98	Buffalo, Wyo.	Oct. 29, '98	March 15, '99	137 days

pleted and unpublished experiments conducted in the greenhouse of Columbia University during the winter of 1898–99.

The above were planted under practically the same conditions as the Arizona specimens. The sclerotia from fifteen species of northwestern grasses were planted at this time, but only these three grew. On the 19th of January, duplicates of these fifteen specimens were planted, thoroughly moistened, and placed out of doors during freezing weather for two days. The first to show development were those of *Agropyron spicatum* which produced mature stromata in forty-four days. Without check cultures it can not be positively stated whether the shortening of the period was due to the freezing or to the natural consequence of the period of rest. The main point of interest results from a comparison of these periods of development with those of the Arizona species.

This species, which is very distinct in the sclerotial stage from all published species, may be characterized as follows:

Claviceps cinereum sp. nov.

Sclerotia clavate, gradually tapering upward, straight, curved, twisted or contorted, 1.5 to 3 cm. in length by 1.75 to 2.5 mm. in diameter at the base, very viscid while developing, the base permanently invested by the flowering glumes of the host, which are smooth, shining, black and closely adherent; smooth as far as covered by the glumes, but reticulated for some distance above this; the reticulations gradually disappearing upward and merging into closely placed longitudinal striations which in turn disappear near the apex, where the surface is nearly smooth or irregularly roughened; dark gray at base, but gradually fading out to a very light gray or almost white at the apex. In section the base possesses an external zone of a dark gray color on the outside, within which is a much wider distinctly marked zone of a very light gray, while the center, less definitely bounded, is almost pure white; at the apex these divisions are absent. Stroma erect, erumpent with a cylindrical or usually slightly fusiform, short, stout almost white stalk, and a subglobose head usually slightly flattened below and overlapping the upper end of the stalk, 1.75–2.75 mm. in diameter; head light gray, almost smooth, viscid, punctiform with small darker points indicating positions of perithecia. Perithecia sunken, not projecting above stromatic mass, ovate to very slightly pyriform, 190–225 μ × 60–90 μ. Asci 8-spored, fasciculated, narrowly cylindrical, slightly narrowed below into rather

long stout pedicels, and slightly enlarged at attachment, rounded above, 135–150 μ × 4–5 μ. Paraphyses wanting. Spores nearly parallel, filiform, coarsely but rather indistinctly guttulate, 100–120 μ × 1–1.5 μ.

Growing in inflorescence of *Hilaria mutica* and *H. cenchroides*, Cochise, Arizona, October, 1900.

UNIVERSITY OF ARIZONA, March, 1901.

Notes on Fournier's Mexican Species and Varieties of Bromus*

By C. L. Shear

In the spring of 1900, Mr. A. H. Baldwin, an artist of the Department of Agriculture, then employed in the Division of Agrostology, visited Paris and while there examined some of the specimens of *Bromus* cited by Fournier and preserved in the Herbarium of the Museum of Paris. Through the courtesy of the Director he was permitted to make sketches of these plants and to take spikelets from each; he also made notes in connection with his sketches, and by aid of these it has been possible to identify some of the forms treated by Fournier. While there is still much to be desired in order to make a thoroughly satisfactory disposition of the Mexican species, it is thought best to present the information thus acquired in the hope that it may be of some use to students of Mexican grasses.

With the exception of *Ceratochloa festucoides* the species and varieties are taken up in the order in which they are given by Fournier in his work.

BROMUS EXALTATUS Bernh. Linnaea, **15**: Lit. 90

B. subalpinus Rupr. Bull. Acad. Roy. Brux. **9**: 237. 1842, is cited as a synonym of this. Consultation of this citation shows this name to be a *nomen nudum*. A comparison of three of the specimens cited by Fournier (Gal. 5769 & Liebm. 488 and 501) with the original description of Bernhardi leaves considerable doubt as to whether they are correctly referred. Only an examination of the type which we have been unable to locate will decide the question. Dr. Trelease informs me that it is not in the Bernhardi Herbarium. No. 925, C. L. Smith, Sierra de San Felipe, Sept., 1894, seems to belong here.

BROMUS ANOMALUS Rupr. Fourn. Mex. Pl. 126. 1886

This is attributed to Ruprecht in Bull. Acad. Roy. Brux. **9**[2]:

* Fournier, Mexicanas Plantas, etc., Pars secunda. Graminae, 125–128. 1886.

236. 1842. It is, however, without description in the place cited by Fournier and must be regarded as first published by him as cited. The question arises, however, as to what should be considered the type of this species. Ruprecht l. c. cites a single specimen, no. 5757 H. Galeotti collected "dans les forêts du Cerro San Felipe près d'Oaxaca à 8000 pied d'élèvation." The same number is also cited by Fournier and his specimen should, we think, be considered the type of the species rather than the first specimen cited by him which it seems to us best to take as a rule. The sketch and spikelet from Galeotti's no. 5757 in the Museum of Paris shows this plant to be inseparable from *Bromus Porteri* (Coult.) Nash. Fournier speaks in his description of a conspicuous tongue-shaped ligule, but Mr. Baldwin's sketch of the specimen does not show a ligule any larger than is usually present in *Bromus Porteri*, and we feel safe in referring *Bromus anomalus* to *B. Porteri* (Coult.) Nash as a synonym.

All the following forms belong to the subgenus *Ceratochloa*.

CERATOCHLOA FESTUCOIDES Beauv. Fourn. *l. c.*

This name used by Beauvois in the index to his Agrost. 158, is taken up for the *Ceratochloa unioloides* Beauv. Agrost. Ind. 164 and Explan. Pl. 11. 1812. We can find nothing in Beauvois to justify the assumption that these were regarded by him as synonyms. The inference we make from a comparison of similar cases in Beauvois is that he was either proposing a new species or transferring Link's *Bromus festucoides* to *Ceratochloa*. From the fact that he uses the combination *Ceratochloa unioloides* in his explanation of plates it appears to be clear that he did not intend to supplant the name *Festuca unioloides* by *Ceratochloa festucoides*. Supposing, however, that it were a clear case of synonymy, we can see no reason for adopting the name *festucoides* instead of *unioloides*. In any case its use in the genus *Bromus* is invalidated by the existence of an earlier *Bromus festucoides* Link, Schrad. Journ. **2**: 315. 1799.

An examination of a drawing of the type of *Bromus unioloides* H.B.K. and a spikelet from the same shows that the doubt indicated by the writer in Bull. **23**: 50. Div. Agrost. U. S. Dept. Agr. regarding the synonymy of the species was well founded and

that the *Festuca unioloides* Wild. is specifically distinct from *Bromus unioloides* H.B.K.

Kunth.* regarded the two as distinct and proposed the name, *Bromus Willdenowii* for Wildenow's plant. *Ceratochloa Schraderi* Kunth has priority but is also a doubtful synonym, so that we regard the adoption of *Bromus Willdenowii* Kunth. as the safest.

Bromus Willdenowii is evidently not common in Mexico, as there are no specimens in the National Herbarium and Fournier, l. c. says that he has seen no Mexican specimens. He, however, cites two numbers—Aschenb. 146, 674—on the authority of some one else apparently. We have seen none of the specimens cited by Fournier, but his description appears to have been based upon a form of *Bromus Willdenowii*, probably the one which we called *B. unioloides haenkeanus* (Presl.) Shear† but which should stand according to our present understanding of the matter **B. Willdenowii haenkeanus** (Presl) n. comb. Fournier restricts *Ceratochloa* to this one species, but according to our interpretation of it as a subgenus all the following forms should also be referred to it.

BROMUS HOOKERI Fourn. Mex. Pl. 127. 1886

This name was proposed by Fournier for the plant referred by Hooker and Arnott in the Botany of Capt. Beechey's Voyage 119. 1841 to *B. purgans* Rich. What Hooker's plant really was we are unable to say. It was collected in Kamtschatka. The name *B. Hookeri* we do not regard as tenable, however, in any case, as there was already a *Bromus Hookerianus* Thurber, Wilkes U. S. Expl. Exp. **17**[2]: 493. 1874.

BROMUS HOOKERI var. *a* SCHAFFNERI Fourn. *l. c.*

This plant as shown by the drawings and spikelet from Fournier's type no. 42 Schaffner in Herb. Franq., can not be separated from *B. carinatus Hookerianus* (Thurb.) Shear, so far as we can determine from a careful comparison of the spikelets from the two types. Fournier's plant has a panicle rather more lax than typical *Bromus carinatus Hookerianus*, otherwise the plants appear alike and can not be satisfactorily separated.

* Kunth. Rev. Gram. **1**: 134. 1835.

† Bull. Div. Agrost. U S. Dept. Agr. **23**: 52. 1900.

BROMUS HOOKERI var. β MARGINATUS Fourn. *l. c.*

This is given as a synonym of *B. marginatus* Nees in Steudel Syn. Pl. Gram. 322. 1854, but differs from that plant as we understand it in its rather lax, somewhat drooping panicle, longer, more acute, and smooth empty glumes, and scabrous flowering glume. We propose for this plant the name *Bromus proximus* nom. nov. The specimen from which the spikelet examined was taken and the sketch made was no. 1488 Botteri & Sumchrast. The first specimen cited by Fournier, which we should prefer to regard as the type of the species, is no. 961 F. Mueller, collected at Orizaba. Nos. 5, 7, 226, Dr. E. Palmer, Saltillo, 898 and no. 171a of the same collector from the city of Durango and vicinity, June, 1896, we should refer to this species.

BROMUS HOOKERI var. γ SCHLECHTENDALII Fourn. *l. c.*

We have drawings and spikelets from two of the specimens cited by Fournier—no. 402 Berlandier "inter Tampico et Real del Monte" and no. 1420 bis Virler, San Luis de Potosi. The spikelet from Berlandier's specimen does not agree with the description which says the flowering glume is very shortly and sparsely pilose. The plant is closely related to *Bromus proximus*, and may perhaps be best referred to it as a variety until more information can be secured regarding it. According to the description, sketches, and spikelets it differs from *Bromus proximus* in the slightly longer and more acute empty glume, and somewhat pubescent flowering glume with a slightly longer awn and a small contracted panicle. This plant we would designate **Bromus proximus Schlechtendalii** n. comb. We would refer no. 734 Dr. Edward Palmer's collection, September, 1896, from the city of Durango and vicinity, to this variety.

BROMUS HOOKERI var. δ GENUINUS Fourn. *l. c.*

This the author regards as synonymous with *Bromus purgans* L. Sp. Pl. ed. 2. 1: 113. 1762. The misinterpretation of Linnaeus's species is evidently due to his reference l. c. to Feuillet's plate. Fournier's variety was founded upon a part of Bourgeau's no. 220, collected "in sylva de la desierta Vieja." According to the sketches and spikelets from the specimen in the Museum of

Paris this differs from *B. proximus Schlechtendalii* in having a large drooping panicle. There is some doubt in our mind as to whether the spikelet we have is from the particular plant of Bourgeau's that was taken by Fournier as his type. The form is of doubtful varietal value but may stand until better known as *Bromus proximus genuinus* n. comb. No. 171 E. Palmer, Durango, June, 1896, belongs here. *B. Schaffneri* (Fourn.) Scribn. & Merrill U. S. Dept. Agr. Div. Agrost. **24**: 30. 1901 was founded in part upon the specimen first cited.

BROMUS HOOKERI var. ε PUBESCENS Fourn. *l. c.*

This he regards a *B. pubescens* Muhl. which he wrongly interpreted, that plant belonging to the subgenus *Zerna*. According to the sketches and spikelets from 1417 and 1420 collected by Virler at San Luis de Potosi this cannot be distinguished from *Bromus proximus genuinus* and we regard it as a synonym of that variety.

BROMUS HOOKERI var. ζ CANADENSIS Fourn. *l. c.*

This plant he regarded as *B. Canadensis* Mx. We unfortunately have no sketch or spikelets from any of the specimens referred to this variety. From the description we infer, however, that it is at least varietally distinct from the other forms described, but before giving it a name, we prefer to wait until we have had an opportunity to examine authentic specimens of the plant.

The other forms treated by Fournier are *Bromus Hookeri* var. η *ciliatus*, incorrectly regarded as *Bromus ciliatus*; *Bromus Hookeri* var. θ *pendulinus*, regarded as synonymous with *Bromus pendulinus* Sesse, and the two subvarieties α *brevicaulis* and β *longicaulis* without descriptions.

There are several species of the older authors described from Mexican material whose identity is still doubtful and must remain so until the types, if extant, can be studied and redescribed, and no permanent or satisfactory disposition of the Mexican material can be made until these older specimens are understood.

WASHINGTON, D. C.

Teratology of Arisaema

By Rosina J. Rennert

Variations of form in the inflorescence of *Arisaema triphyllum* have frequently been noted. Double spathes, which included a single spadix, were described by W. W. Bailey in 1884.* A curious case was reported by August F. Foerste who published an account † of a specimen of *A. triphyllum* which bore two leaves upon the same petiole. Arising from the axil of the double leaf was a double flowering stalk. The stems of the spathes were united below, but the spathes were separate and placed back to back. Each had a perfectly normal spadix bearing ovaries.

Double spadices also were described by Bailey.‡ The two spadices were completely separate, in his specimen, only in the upper sterile portion. At the flower-bearing part, the two columns were completely fused. One of the spadices was deformed and much shorter than the other, being flattened below and dilated at the tip.

In *Arum maculatum*, a European aroid, similar monstrosities have been noted by Masters and Braun. The former described a case in which the spathe had taken the form of a stalked leaf.§ In another instance the number of spathes was increased.‖ In another the spadix was flattened,¶ and in a fourth case, a genuine perianth was developed about the flowers on the spadix.** Braun reported the occurrence of a branching spadix, and the multiplication of spathes in several instances.††

Dr. MacDougal has collected and grown several specimens which illustrate variations in the inflorescence of *Arisaema tri-*

* Botanical Gazette, 9 : 177. 1884.
† Botanical Gazette, 19 : 464. 1894.
‡ Bulletin Torrey Club, 9 : 91. 1882.
§ Vegetable Teratology, 245. 1869.
‖ Ibid., 358.
¶ Ibid., 329.
** Ibid., 225.
†† Verhandlung Bot. Vereins Brandenberg, 1 : 93, 95. 1859.

phyllum, and *A. Dracontium*. No description of these deformations has yet been published. One of these examples is a flowering stalk of *Arisaema triphyllum*, in which the spathe is abortive, being represented only by an irregular rudimentary scale on the axis some distance below the pistils (Fig. 1, *E*). The spadix of this specimen has too confluent stigmas not represented in the drawing.

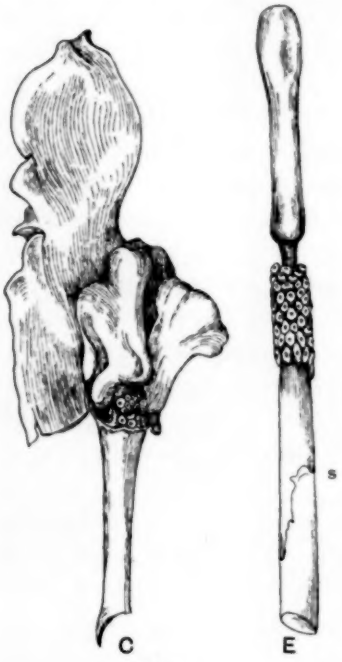

FIG 1.

FIG. 2.

FIG. 1. Teratological formations of *Arisaema triphyllum*. *C*, inflorescence with 3-lobed column; *E*, inflorescence with spathe represented by rudimentary scale, *s*.

FIG. 2. Teratological formations of *Arisaema*. *M*, inflorescence of *A. triphyllum* with branching spadix, and shortened spathe; *N*, tip of spadix of *A. Dracontium* with hooked apex.

In this case the stigmas on two adjacent ovaries are removed from their normal central position, to one at the side where the broad tops of their ovaries are in contact and their stigmatic surfaces are confluent. As neither is at all diminished in size, the united stigmas present a broad elliptical surface. The ovaries which bear these united stigmas are entirely distinct, however. The sterile portion of the spadix, although rather long and thick, is normal.

Another specimen bears a branched spadix resembling the double spadices described by Bailey. In this case however, it appears that the two sterile columns borne at the top of the fertile portion of the spadix are not the tips of two separate spadices which are confluent below, but rather two sterile branches of a single spadix; for the fertile portion shows no trace either external or internal, of a division into two columns which we might expect were two spadices united here. The branching takes place just below the tip of the pistil-bearing part of the spadix and both branches are entirely sterile. The actual tip of the fertile portion between the branches is covered with ovaries. The spadix might be described as very much shortened and fertile throughout its entire length, bearing two sterile branches very near its tip. The two branches are not of equal size. The shorter one is a trifle thinner and slightly deformed. Another instance of fused stigmas occurs here. The stigmas are displaced and united as before and the stigmatic surface so formed is twice the size of that of a single normal stigma. No fusion has occurred between the ovaries. The spathe in this case is shortened and does not extend to the tip of the longer branch of the spadix (Fig. 2, *M*).

In a third specimen, the stalk of the inflorescence is greatly flattened at the point of insertion of the spathe and spadix. The spadix is also flattened and very fleshy, bearing ovaries at the base closely crowded together. Its fertile portion is however, less than half the depth of the flower-producing part of a normal spadix. Above the fertile region, the spadix is greatly expanded. It has a broad insertion across the top of the flat fertile portion and becomes wider rapidly, being somewhat unsymmetrically obovate in general outline. It is very unevenly cleft into three lobes, the upper edge of the formation is somewhat dilated, resembling the normal dilatation at the tip of the spadix of *A. triphyllum*. The lower portion of one of the lobes is fertile, bearing a single ovary a short distance above its base (Fig. 1, *C*). It is worthy of note that the majority of individuals of *A. triphyllum* which show variations are pistillate.

A specimen with a similar malformation developed in the experimental greenhouse of the N. Y. Botanical Garden. In this case, however, the flower-bearing axis is normal, except that the ter-

minal sterile portion is expanded into a laminar structure of irregular outline, and showing a few plaited foldings.

No records have been found of monstrosities in *Arisaema Dracontium*. One specimen of *A. Dracontium* in Dr. MacDougal's collection shows a curious malformation of the tip of the spadix. The spathe and spadix of this plant seem to be normal in every respect except that the tip of the spadix has grown out into a crescent-shaped process, on one horn of which a minute elevation may be seen (Fig. 2, *N*).

Other malformations in both species of *Arisaema* are produced by the action of the *Aecidium* with which they are often infected. The infected individuals develop earlier than the normal ones and show leaves with diminished surfaces, crinkled laminae, and inrolled margins. The spadices are variously distorted, and the spathes have the terminal portion, constituting the hood, in an erect position instead of drooping over the spadix. It is not known whether the specimens developing earliest are most subject to infection, or whether the presence of the fungus in the plant induces earlier activity, although the latter seems more probable.

The leaves of seedlings and offsets exhibit reversions to unusual forms in a very interesting manner, and will be discussed in a future article.

Proceedings of the Club

TUESDAY EVENING, FEBRUARY 12, 1901

This meeting was held at the College of Pharmacy, with Dr. Rusby in the chair; 14 persons present.

The committee to consider the proposed transfer of the Club herbarium to the Botanical Garden reported in favor of donating the Club herbarium in accordance with the following recommendations; which were thereupon adopted by vote of the Club:

The Torrey Botanical Club offers to donate its herbarium to the New York Botanical Garden, under the following regulations:

(*a*) That the Torrey Botanical Club herbarium should constitute the nucleus of the separate local collections of the Garden, to be known as the Torrey Botanical Club Local Herbarium, or by some similar name agreed upon.

(*b*) That the Garden take proper care of the same, supplement it from its own collections, and from future gifts from members of the Club and other persons, so that it may contain representations of all of the species growing within the 100-mile limit.

(*c*) That the members of the Garden staff keep the specimens properly named and labelled so that the collection may be of the best possible service.

(*d*) That all members of the Club shall have full and free access to this collection.

The scientific progam followed, introduced by a paper by Dr. J. K. Small, "Notes on some Species of *Rudbeckia*."

Dr. Small exhibited a series of specimens of *Rudbeckia* illustrating groups typified by *R. hirta*, *R. triloba*, *R. laciniata*, etc. Numerous critical characters depending on style-tips, form, serration or lobation of leaves, etc., were discussed. About 25 species occur east of the Rockies, 3 native to our own vicinity.

All evidence shows *Rudbeckia hirta* to be an introduced plant in the northeastern states, perhaps from Maryland northward. Dr. Underwood remarked that *R. hirta* seemed to be first introduced into Central New York about 1864. Dr. Rusby referred to its rarity within his memory in the vicinity of New York City and to the recently discovered medical value of the related genus *Branneria*.

Dr. Britton called attention to the supposed variants of *R. hirta* with parti-colored rays, as suggested by plants from near Philadelphia and from Staten Island.

Dr. Britton presented the subject of the relationship of our woodland species of *Circaea*, *C. Lutetiana* being the representative near New York City, and extending widely around the world. The characteristic bristles of the fruit fail to appear in a remarkable specimen from Ohio which was exhibited. *C. intermedia* of Central Europe was also discussed in its relations to the foregoing.

Dr. Britton exhibited a series of specimens of *Antennaria neodioica* Greene, a species which seems to be easily distinguished from the others of eastern North America by its spatulate basal leaves, distinctly mucronate, tapering rather abruptly from well above the middle into a long narrow base, which, however, can scarcely be called a petiole. He showed specimens of the plant collected in company with Professor Greene at Bushkill, Pa., on the Club's Field Meeting, May 30, 1897, at which time Professor Greene first insisted on its specific difference from *A. plantaginifolia* with which it grew. The series included authentic specimens of *Antennaria rupicola* Fernald, which differs from the typical specimens of *A. neodioica* only in the yellowish involucre, and slightly less abruptly tapering leaves, collected by Mr. Fernald at Island Falls, Aroostook Co., Maine, also specimens of *A. neodioica attenuata* Fernald, and of *A. neodioica grandis* Fernald, discussing their relationships with previously described species.

Dr. Rusby referred to the similar variability of Andean species of *Gnaphalium* as seen by himself and other botanists in Bolivia.

Dr. Howe discussed the relationship of *Riccia Beyrichiana*, the hepatic which he had considered to be probably identical with one discovered by Mr. R. M. Harper near Athens, Georgia, last summer. The loan of the type-specimen from Vienna now shows that the two are wholly distinct, Mr. Harper's plant representing a new species, described in the Bulletin for March. *Riccia Beyrichiana* seems therefore to be still known only from the original collection of 1833.

Adjournment followed.

EDWARD S. BURGESS,
Secretary.

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